PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

PLATING OR COATING METALS WITH METALS.

A.D. 1860.

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PREFACE.

YEAR by year the Indexes to Patents are becoming more numerous and expensive; and many inventors and others to whom they have become indispensable are thereby precluded from purchasing them.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of Invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Subject-matter, Reference, and Alphabetical Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the latter are sold have been added.

The present series of abridgments comprises only those Specifications that relate to *processes* for coating metals with metals. Applications in which processes have not been expressly stated are omitted; but whenever any reasonable doubt exists as to whether a Specification should be embraced by the series or not, its abridgement is included; thus the title "Plating or Coating Metals with Metals" has been strictly adhered to.

All inventions that specifically relate to pickling or otherwise preparing metals to be coated with metals are included in this series. These abridgments also comprise inventions that relate to combining metals that are intended to coat other metals.

Specifications that relate to *electrotyping* are not included in this series; only those electro-depositing Patents which refer to coating metals permanently with metals are comprised in this work.

Specifications that relate to "coating iron with steel," by case-hardening the iron, are not included in this series.

All the quotations from the printed Specifications (included between quotation commas throughout the work) are given in the exact punctuation and orthography therein used; however, to draw attention to any passage more immediately connected with this series of abridgments, portions are sometimes italicised that appear in Roman type in the original.

The publication of these abridgments tends to prevent an old invention from being re-patented; it is hoped, therefore, that inventors in this portion of applied science will only exert their talents upon discoveries that are new.

B. WOODCROFT.

July, 1862.

INDEX OF NAMES.

[The names of persons by whom inventions have been communicated from abroad, when known, are printed in *Italics*. The Roman numerals refer to the Introduction.]

INTRODUCTION.

THERE are very few arts, if any, whose history is perfectly comprised within Patent Specifications; it is to supply the gaps which occur in the specifications relating to plating or coating metals with metals that the following chronological arrangement of non-patented inventions in this department of practical science is given. Each discovery or invention has a separate paragraph devoted to it, and has the titles of works affording information upon it explicitly stated; by this arrangement the utmost facility of reference is obtained, and the reader is enabled to extend his knowledge of any particular point to the full amount, from original sources.

The processes that have been employed to coat metals with metals are very numerous; modern practical science has added to their number and at the same time rendered many of them obsolete and out of date. The peculiarities of the principal processes may be classified as follows:—

1st. By amalgamation—using mercury as the means of ensuring contact between the underneath metal and the coating metal, the mercury being finally driven off by heat. This method is principally applicable to gilding and silvering.

2nd. By simple immersion of the article to be coated in an aqueous solution of a salt of the metal to be deposited.

3rd. By fusing a thin sheet of the coating metal on to the underneath metal with the assistance of a flux or intermediate fusible metal, the underneath metal being heated.

4th. By immersion of the article to be coated in a bath of the melted metal or alloy.

5th. By pressure and heat, as in the manufacture of tinned lead pipes.

6th. By casting a considerable thickness of the coating metal round the article to be coated, the article being placed in a suitable mould.

7th. By electro-deposition.

The operations of nature in relation to this branch of applied chemistry are highly instructive, and therefore must not be overlooked. These agencies were active long before man could understand their workings. A notable example of this occurs in the deposition of copper upon spare pieces of iron immersed in a stream passing through a copper mine; the ancients were much puzzled at this circumstance, and for some time believed that a real transmutation of iron into copper took place. The forces concerned in the production of this simple natural result were for a long period unknown, and their laws unexplored, and it was not till the advanced chemical knowledge of the present century was brought to bear upon this and other departments of the subject that the network of causes was fully and profitably investigated; this investigation culminated in the use of electric force in the arts and manufactures which involve the deposition of metal upon metal.

HOLY WRIT contains no account of gilding or otherwise covering metals with metals, although frequent mention is made of gilding wooden structures.

The EGYPTIANS are proved by Herodotus to have been "accustomed to gild wood and metals." (See Bohn's edition of Beckmann's *History of Inventions*, vol. ii., p. 290; also Herodotus, lib. ii., 63.)

The ancient MEXICANS and PERUVIANS appear from the following paragraph to have been in possession of the art of silver plating:—"The silver-plated discs and also the "embossed silver-plate, supposed by Dr. Hildreth to have "been a sword ornament, have been critically examined, "and it is beyond doubt that the copper boses" [bosses?] "are absolutely plated, not simply overlaid with silver, "and has been done by heat." (See Silliman's *Journal*, vol. ii.; also *The Ancient Workers and Artificers in Metal* by James Napier, p. 70.)

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77. PLINY in A.D. 77, in the 33rd book of his Natural History, chap. 20, states that the most convenient method of gilding copper is to employ quicksilver. (See Bostock and Riley's translation of Pliny's *Natural History*, vol. vi.,

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p. 99; also Dr. R. Watson's *Chemical Essays*, vol. iv., pp. 220, 221.)

77. PLINY, in A.D. 77, in the 33rd book of his Natural History, chap. 42, sets forth that "silver is gilded almost exclu- "sively by the agency of hydrargyros," [quicksilver separated from its ore by fire?] (See Bostock and Riley's translation of Pliny's *Natural History*, vol. vi., p. 124; also Dr. R. Watson's *Chemical Essays*, vol. iv., p. 220.)

77. PLINY, in A.D. 77, in the 34th book of his Natural History, chap. 43, states that silver is applied upon copper in the same way as tin is applied upon it. (See Dr. R. Watson's *Chemical Essays*, vol. iv., pp. 187, 188.)

77. PLINY, in A.D. 77, in the 34th book of his Natural History, chap. 48, says, "When copper vessels are coated with "stannum, they produce a less disagreeable flavour, and "the formation of verdigris is prevented." (See Bostock and Riley's translation of Pliny's *Natural History*, vol. vi., p. 214; also Dr. R. Watson's *Chemical Essays*, vol. iv., pp. 185, 186.)

"ANKETIL, a monk of St. Albans, about the beginning of
1100. "the 12th century, was so famous for his works in gold, "silver, *gilding*, and jewellery, that he was invited by the "King of Denmark to superintend his works in gold, "and to be his banker or money changer." (See Lardner's Cabinet Cyclopædia, *Treatise on Manufactures in Metal*, 1849, vol. iii., p. 376.)

1403. An ACT OF PARLIAMENT was passed in 1403 "to prevent "deception in putting off gilt or plated locks, rings, "beads, candlesticks, harness for girdles, chalices, sword "pummels, powder boxes, &c. for solid metal; all such "workmanship upon copper or latten being prohibited, "except ornaments for the church, of which some part "was to be left uncovered, to show the copper or brass." (See Lardner's Cabinet Cyclopædia, *Treatise on Manufactures in Metal*, 1849, vol. iii., p. 355.)

FREDERICK HAGELSHEIMER, or HELD, on the 19th of
1608. March 1608 obtained from the Emperor Rodolphus II., an extension of his patent that related to wire-drawing, in

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which "works of copper gilt with silver or gold," were included. This extension comprised the city of Nuremberg and the whole empire. (See Beckmann's *History of Inventions*, Bohn's edition, vol. i., pp. 420, 421.)

1620. A CLERGYMAN, about the year 1620, is said to have carried the art of tinning from Bohemia into Saxony. (See Lardner's Cabinet Cyclopædia, *Treatise on Manufactures in Metal*, 1849, vol. iii., p. 27.)

1663. The Hon. ROBERT BOYLE, in 1663, states that an ingenious tradesman used to coat iron with copper, by means of a solution of "vitriol that has copper in it;" after being coated with copper the article was gilt by means of an amalgam of gold. (See *Some considerations touching the usefulness of Experimental Philosophy*, Essay x., pp. 41, 42.)

1663. The Hon. ROBERT BOYLE, in 1663, mentions a method of silvering by means of crystalline nitrate of silver mixed with "chrystals of tartar." The mixed powder is rubbed over the cleaned and wetted brass. (See *Some considerations touching the usefulness of Experimental Philosophy*, Essay x., pp. 46, 47.)

1667. ATHANASIUS KIRCHER, in his "China illustrata," published about the year 1667, describes some lakes that are said to exist in China that "change copper into iron." This notice is interesting in respect to the coating of copper with iron by means of a solution of iron, to which it evidently refers, although what solution of iron, unassisted by direct or indirect electric force, would have that effect it is difficult to say. (See *Philosophical Transactions*, vol. ii., p. 485.)

1670. ANDREW YARRENTON, about the year 1670, was sent at the expense of an English company to Saxony in order to learn the process of tinning. (See Lardner's Cabinet Cyclopædia, *Treatise on Manufactures in Metal*, 1849, vol. iii., p. 27; also Dr. R. Watson's *Chemical Essays*, vol. iv., pp. 203–206.)

1678. Dr. CHRISTOPHER MERRET, in the year 1678, published an account of the tin mines in Cornwall, in which he

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states that certain water containing "vitriol" "soon "changeth small iron rods put into it; and they say, that "in a very little time it will assimilate the rods into its "own nature." This statement evidently has relation to the deposition of a metal upon iron by the immersion of the iron into a solution of that metal. (See *Philosophical Transactions* for March 1678, No. 138, pp. 950, 951.)

1685. The Hon. ROBERT BOYLE, in his work on "Specific Medicines," published in 1685, states that if clean plates of copper be immersed in a dilute solution of silver by aquafortis, "the metal will be very slowly precipitated out "of it," "at the beginning in the form of pure shineing "scales of silver, almost like the white and glittering "scales of some small fishes." He goes on to say, "There is also a way, by which I have brought dissolv'd "gold to settle about a body, suspended in the solution "in the form of a fine and high coloured calx of pure "gold. But you may easily see an instance of silent "precipitation, if you do but rub a little either Roman "or Dantzick vitriol upon the well whetted blade of a "knife wetted with water or spittle, for you will have the "steel, almost in a trice, overlaid with a reddish sub-"stance, which, by its colour and other signs, appears "manifestly to be cupreous." (See *Of the reconcileableness of Specifick Medicines to the Corpuscular Philosophy*, pp. 65, 66.)

1685. Dr. EDWARD BROWNE, in his "Travels," published in 1685, states that in a mine near the town of Herrn-grundt, in Hungary, there are "two springs of a vitriolat water "which turn iron into copper, called the old and the new 'Ziment." This narration has an interesting relation to the history of coating iron by immersion in a solution of copper. He also mentions drinking out of a gilt cup made of the above-mentioned copper, which bore the inscription "Copper I am, but iron was of old, silver I "carry, covered am with gold." (See *A brief account of some travels in divers parts of Europe, &c.*, 2nd edition, pp. 68, 69; also Dr. R. Watson's *Chemical Essays*, vol. i., p. 235.)

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1698. ROBERT SOUTHWELL, in the year 1698, described the method of "dry gilding." This "is a light method of "gilding, by steeping linen rags in a solution of gold, "then burning them; and with a piece of cloth dipped "in salt water, rubbing the ashes over silver intended to "be gilt." (See *Philosophical Transactions* for the year 1698; also Bohn's edition of Beckmann's *History of Inventions*, vol. i., p. 19.)

1742. Mr. THOMAS BOLSOVER, and Mr. JOSEPH HANCOCK, about the year 1742, commenced the manufacture of "Sheffield Plate." (See Lardner's Cabinet Cyclopædia, *Treatise on Manufactures in Metal*, 1849, vol. iii., p. 357; also Dr. R. Watson's *Chemical Essays*, vol. iv., p. 212.)

1752. The REV. WILLIAM HENRY, D.D., in the year 1752, states that in some copper mines, near Wicklow in Ireland, there is a stream of water containing copper, and he describes a method of precipitating the copper upon iron bars from the said water. This method consists in immersing them into the water, when they gradually become covered with copper at the expense of the iron. Mr. MATTHEW JOHNSON first proposed this method of collecting the copper. (See *Philosophical Transactions*, vol. xlvii., pp. 500–503; also vol. xlviii., pp. 94–96; also vol. xlviii., pp. 181–190; also Dr. R. Watson's *Chemical Essays*, vol. i., pp. 238–240.)

1753. Dr. JOHN BOND, in 1753, deposited copper upon iron, also upon silver and tin. The process employed was to take some water from the copper mines at Wicklow—the same above referred to—and immerse therein the metal to be coated. (See *Philosophical Transactions*, vol. xlviii., pp. 181–190.)

1754. Mr. WILLIAM LEWIS, in 1754, precipitated platinum as a black or greyish powder from its solution in aqua regia upon zinc, iron, and copper. (See *Philosophical Transactions*, vol. xlviii., p. 657.)

1780. Dr. FORDYCE, in 1780, deposited silver upon copper, and copper upon iron, by means of acid solutions of those metals; he states "if two metals be combined with an

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" acid, if we apply to the solution a mass of that which " attracts the acid strongest, the other will be precipi- " tated." He further sets forth, "If the metals mixed " are unknown, if we can find an acid which will dissolve " them, we may try to make a precipitation with the " metal which is lowest but one in the order of elective " attractions, and so proceed to the next above it, until " we come to the highest; and by this means we shall " obtain all the metals in the mass." (See *Philosophical Transactions*, vol. lxx., pp. 35, 36.)

1780. M. L'ABBÉ MARCI, in 1780, recommended tinning copper vessels "with pure block-tin from England." (See Dr. R. Watson's *Chemical Essays*, vol. iv., p. 153; also, the *Memoirs of the Royal Academy* at Brussels, for the year 1780.)

1782. Mr. KIRWAN, in 1782, precipitated or deposited the following metals from their solutions:—Copper from its solution in "vitriolic acid" upon iron; also, from its solution in "nitrous" and "marine" acids upon iron; silver from its solution in "nitrous acid" upon iron. In "nitrous acid" "iron precipitates zinc." Zinc precipitates iron from the "marine" acid. Copper precipitates silver from its solution in "nitrous" acid. Lead precipitates iron from the "marine" acid. Mercury is quickly precipitated from the "vitriolic" acid by copper. Mercury precipitates silver from "nitrous" acid, also from "marine" acid. Zinc precipitates nickel as a black powder "in the vitriolic and nitrous acid." "Zinc precipitates "nickel from the marine acid." "Iron clearly precipitates "nickel from the nitrous acid." "Nickel precipitates "copper in its metallic form from the vitriolic acid. It also "precipitates copper from the nitrous and marine acids." "Nickel readily precipitates wismuth" [bismuth?] "from "the vitriolic and nitrous acids." The deposition of other metals and "semi-metals" upon and by other metals and "semi-metals" are stated; but these substances not being fully understood at this date, and there being considerable difficulty in obtaining even the metals

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pure, the results could not be depended upon. (See *Philosophical Transactions*, vol. lxxiii., pp. 73–84.)

1788. Professor GADOLIN, about 1788, investigated the circumstances requisite to produce a precipitate of metallic tin on copper. He found that it was necessary to have undissolved metallic tin in the solution, and that the solution should contain excess of acid. (See Aikin's *Dictionary of Chemistry and Mineralogy*, vol. ii., pp. 427, 428.)

1790. Mr. KEIR, in 1790, made many experiments upon the requisite conditions for precipitating silver upon iron by a solution of silver in "nitrous" acid. He found that an acid solution, to which spirits of wine had been added, would precipitate its silver upon iron immersed in it. (See *Philosophical Transactions*, vol. lxxx., p. 377.)

1801. Mr. CHENEVIX, in 1801, in making some experiments upon the arseniates of copper and of iron, reduced copper from its solution in muriatic acid by the immersion of zinc, tin, and iron therein. In another experiment metallic arsenic was reduced from a solution of the "oxide of "arsenic" in water, by the immersion of zinc, tin, or iron therein. (See *Philosophical Transactions*, vol. xci., pp. 211, 212.)

1801. Dr. WOLLASTON, in 1801, states:—"If, for instance, "the solution contains copper, it will be precipitated by a "piece of iron, and appear on its surface. Upon silver "merely immersed in the same solution no such effect is "produced; but, as soon as the two metals are brought "into contact, the silver receives a coating of copper." (See *Philosophical Transactions*, vol. xci., p. 428.)

1803. HISINGER and BERZELIUS, in 1803, "ascertained, by a "numerous series of experiments, the transfer of the ele-"ments of water and of neutral salts to the respective "poles of the battery." (See *Encyclopædia Metropolitana*, vol. iv., art. Galvanism, pp. 221, 222; also *Gehlen's Journal*, vol. i., 1803.)

1804. Mr. CRUICKSHANK, in some experiments published in 1804, found that by the action of the electric force of the galvanic battery upon certain metallic solutions, the

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metals contained in them "were revived." (See Wilkinson's *Elements of Galvanism*, vol. ii., p. 55.)

1804. Dr. WOLLASTON, in 1804, used bars of iron to precipitate platinum from its solutions. Zinc was also used to precipitate platinum. The metal reduced also contained iridium, rhodium, palladium, and osmium. (See *Philosophical Transactions*, vol. xciv., p. 420.)

1804. Messrs. FOURCROY, VAUQUELIN, and THENARD, about the year 1804, made experiments that had relation to the electro-deposition of metals upon metals. (See Napier's *Electro-metallurgy*, in the Encyclopædia Metropolitana, p. 2.)

1805. BRUGNATELLI, in 1805, in a letter to Van Mons, mentions among other scientific facts, that "he had gilt in a complete manner two large silver medals, by bringing them "into communication by means of a steel wire with the "negative pole of a voltaic pile, and keeping them one "after the other immersed in ammoniuret of gold, newly "made and well saturated." (See Smee's *Electro-metallurgy*, History, pp. xxv., xxvi.; also the *Philosophical Magazine* for 1805; also Napier's *Treatise on Electro-metallurgy*, in the Encyclopædia Metropolitana, pp. 2, 3.)

1806. HUMPHRY DAVY, in his Bakerian Lecture in 1806, states that when metallic solutions were submitted to the action of the galvanic current, "metallic crystals or depositions "were formed, as in common galvanic experiments, on "the negative wire." "With solutions of iron, zinc, and "tin, this effect took place, as well as with the more "oxidable metals." (See *Philosophical Transactions*, vol. xcvii. p. 18.)

1807. BUCHOLZ, in 1807, obtained "crystals of metallic copper by "the aid of a simple voltaic circle." (See *Philosophical Transactions*, vol. cxxvii., p. 37.)

1813. Dr. WOLLASTON, in 1813, described his method of drawing extremely fine wires. *Silver was cast round a platinum wire stretched in the centre of a suitable mould*, the compound wire drawn to the greatest degree of fineness attainable by a draw-plate, then the silver dissolved off by "nitrous acid." In this way wires $\frac{1}{5000}$th of an inch

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in diameter were obtained. (See *Philosophical Transactions*, vol. ciii., p. 117.)

1830. Professor EDMUND DAVY, in 1830, electro-coated "platina "with gold, silver, copper, &c.," and "gold with a sur- "face of these metals, and tin, copper, brass, iron, &c." His experiments had for their object the detection of metallic poisons, and besides the above metals, arsenic, mercury, and lead were reduced on a strip of platinum by the application of a piece of zinc in contact with the solution and with the platinum. (See *Philosophical Transactions*, vol. cxxi., pp. 147–164.)

1831. Mr. JACOBI, in October 1831, announced his "galvano- "plastic process." This process, among other applications, related to the deposition of copper upon metallic bodies by means of electric force. (See *Encyclopædia Britannica*, eighth edition, art. Voltaic Electricity, p. 635.)

1834. Mr. HENRY BESSEMER, of Camden Town, about the year 1834, electro-deposited "copper on lead castings so as to "produce antique heads in relief for mantlepiece orna- "ments." (See *Encyclopædia Britannica*, 8th edition, art. Electrotypie, p. 627; also *Mechanic's Magazine*, February 1844, p. 73.)

1836. Professor DANIELL, in 1836, says of his constant battery, "no hydrogen made its appearance upon the conducting "plate, but a beautiful pink coating of pure copper was "precipitated upon it, and thus perpetually renewed "its surface." (See *Philosophical Transactions*, vol. cxxvi., p. 119.)

1837. M. BECQUEREL, about the year 1837, effected the reduction of glucina, alumina, and silica, to the metallic state, by means of the action of weak electric currents upon a solution of the metallic salt. (See *Philosophical Transactions*, vol. cxxvii., p. 37.)

1837. GOLDING BIRD, in 1837, described the electric deposition of lead, iron, copper, tin, zinc, bismuth, antimony, silver, manganese, nickel, and silicon, in a crystalline form, by the action of long continued currents of low tension upon solutions of the above-mentioned metals. (See *Philosophical Transactions*, vol. cxxvii., pp. 37–45.)

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1839. Mr. T. SPENCER, on May 8, 1839, gave notice to read a paper on the "Electrotype process" to the Liverpool Polytechnic Society; this paper was read September 12, 1839. The experiments resulting in this discovery were begun in September 1837. Among other matters mentioned in the paper it is said that iron castings may be preserved from the weather by an electro-coat of copper. The single cell process is used. The subject was afterwards brought before the meeting of the British Association at Birmingham. (See *An Account of some Experiments made for the purpose of ascertaining how far Voltaic Electricity may be usefully applied to the purpose of working in Metal*, by Thomas Spencer, Liverpool 1839; also *Mechanic's Magazine*, November 23, 1844, p. 367; also Bakewell's *Electric Science*, p. 176.)

1840. DE LA RIVE, in 1840, made known the process of electro-gilding employed by him in 1828. Platinum and silver wires were electro-gilt "by employing them as negative "electrodes in a solution of chloride of gold." (See De la Rive's *Treatise on Electricity*, vol. iii., p. 546.)

1840. M. DE RUOLZ, on December 19, 1840, took out a patent [in France?] for electro-gilding. The solutions he uses are:—1st, the double chloride of gold and sodium dissolved in soda; 2nd, chloride of gold dissolved in ferrocyanide of potassium; 3rd, sulphuret of gold dissolved in neutral sulphuret of potassium. (See De la Rive's *Treatise on Electricity*, vol. iii., pp. 549–551.)

1841. M. DE ROULZ, in 1841, electro-deposited brass from a solution consisting of the cyanides of zinc and copper dissolved in an aqueous solution of cyanide of potassium. (See Gore's *Theory and Practice of Electro-deposition*, p. 62; also Walker's *Electrotype Manipulation*, last edition.)

1841. Mr. ALFRED SMEE, in 1841, published the results of his electro-metallurgical experiments, and pointed out the laws that regulate the character of the metallic deposit. He gave the name "electro-metallurgy" to the science of depositing metals by means of electricity, because it "comprises the principles regulating all the arts of

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" working in metals by the galvanic force." In relation to the reduction of alloys by means of electric force, Mr. Smee says, " Suppose by using an intense voltaic current, " we compel such a quantity of the force to pass from a " small electrode, that any one compound body in its " vicinity is insufficient to complete the circuit, it would " then be completed through two, three, four, or more " bodies, and it would reduce them all at once." " I have " decomposed twenty different solutions, arranged not as " a series, but as one decomposition cell." Mr. Smee electro-deposited the following metals from their solutions in the reguline form :—Platinum, gold, palladium, iridium, rhodium, silver, nickel, copper, zinc, cadmium, iron, lead, and antimony. (See Smee's *Elements of Electro-metallurgy*, 1st edition, 8vo., London, 1841, also the 2nd and 3rd editions of the same work.)

1845. Mr. C. V. WALKER, in 1845, electro-deposited brass from a strong solution of cyanide of potassium which had been charged with zinc and copper by electric force. He states that alloys of gold and copper, or gold and silver may be electro-deposited by similar means. (See *British Association Report* for the meeting in 1845, p. 30.)

1849. Mr. W. H. WALENN, in 1849, deposited the metals lead and mercury simultaneously upon a zinc plate, by simple immersion in a solution containing hydrochloric acid, corrosive sublimate, and chloride of lead. A zinc plate, thus prepared, was used as a positive plate in a galvanic battery. (See *British Association Report* for the meeting in 1849, pp. 45, 46.)

1857. Mr. G. GORE, in 1857, published his researches with respect to the properties of electro-deposited antimony. The solutions that he used consisted of compounds of the metal either with hydrochloric or with tartaric acid. Amorphous deposits obtained by the above-described means were heated rapidly and to the destruction of their cohesion by striking them feebly with a solid body. (See *Philosophical Transactions*, vol. cxlviii. pp. 185-197.)

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A.D. 1637, July 28.—N° 108.

WHITMORE, THOMAS.—"A spiall priviledge graunted to Capten "Tho. Whitmore & his ass^{s} (for xiiij yeares next ensuing) to prac- "tise and put in use in England and Wales the waies and meanes "of making vitrioll out of copper oare, and of pparing copper "oare and drawing water from the same, *soe as by the use of y^{t} "water to make copper out of iron*, and likewise of pparing of "of any manner of oare soe as by water to sepate the silver from "the said oare without melting the same, whereof he is the true "inventor—paying to His Ma^{ty} a full 15th pte of all such copp "and a tenth pte of all such silver as shal be by him, his depu- "ties, servants, & workmen, soe made & sepated, to be paid "to such psons as the trer or chancellor of the exchequ^{r} shall "nōiate in that behalfe; wth the ordinary provisoe."

[That part of the patent which relates to making "copper out "of iron" by means of certain water that is drawn from copper ore, evidently refers to coating iron with copper by immersion in a solution of a salt of copper.]

[No Specification enrolled.]

A.D. 1670, December 1.—N° 161.

RUPERT, PRINCE.—"A speciall lycence graunted unto his "Highnes Prince Rupert, his executors, adm^{rs}, and assignes, to "use his new invencons of converting into steele all manner of "edged tooles, files, and other instruments forged and formed in "soft iron, or any part of the said tools, files, and other instru- "ments, after they are set, forged and framed, as also all maner of "iron wyre after it is drawne, and of prepareing and softning all "cast and melted iron, soe that it may be filed and wrought as "forged iron is, *and of tinctureing of copper upon iron*; to hold for "14 yeares according to the statute in this case made and provided

" —rendering to His Ma^{ty} the yearly rent of 20^{s}; with such " clauses and non obstantes as are usuall in patents of this nature."

["Tinctureing of copper upon iron" evidently refers to depositing copper upon iron by the immersion of the iron into a solution of a salt of copper.]

[No Specification enrolled.]

A.D. 1671, January 8.—N° 162.

RUPERT, PRINCE, ASHLEY, ANTHONY LORD, and CHICKLEY, SIR THOMAS.—" Whereas His Maj^{y} was lately " pleased to grant unto His Highnes Prince Rupert the sole " liberty of useing his new invenc̃ons for converting into steele " all mañer of edge tooles, files, and other instruments forged and " formed in soft iron, or any part of the said tooles, files, and " other instruments, so forged and formed, and alsoe for the " converting all mañer of iron wyre after it is drawne, &c^{a}, for " the terme of 14 yeares from the sixth day of May last, His " Maj^{y} doth hereby authorize and impower his said Highnes " Prince Rupert, Anthony Lord Ashley, and S^{r} Thomas Chickley " not only to take security, but alsoe to adm̃ister an oath to the " severall workmen, artificers, and persons concerned in the " said arts and invenc̃ons, neither directly nor indirectly to " divulge or make known to any pson or persons whatsoever, " except His Maj^{y}, his heirs or successors, the said arts or inven- " c̃ons, or any of them, or how they are used or ex̃cised, or with " what instrum^{ts} or materialls the same are made and wrought."

[The subject-matter referred to in this patent is evidently the same as that set forth in N° 161.]

[No Specification enrolled.]

A.D. 1673, November 12.—N° 171.

CHAMBERLAINE, WILLIAM.—The title of this invention is " A newe arte, mistery, or invenc̃on of greate vse and benefitt to " this whole nation, and our other countryes, never before pub- " lickly vsed or practized within these our kingdomes of England, " Scotland, and Ireland, or any other our dominions, terrytoryes, " or countryes, for plateing and tynning of iron, copper, steele, " and brasse, as alsoe for the compressing and plateing of all other " mettalls."

[Patent printed, 4*d*. No Specification enrolled.]

A.D. 1691, October 17.—N° 282.

HEMING, EDMUND.—This invention is entitled "Makeing of "iron plates tynned over, cōmonly called tynned plates, as good "as those brought from and made in Germany."

[Patent printed, 3*d*. No Specification enrolled.]

A.D. 1768, August 13.—N° 901.

BOOTIE, JOHN.—Tinning, selling, and vending such copper "and brass vessells (that is to say), ship kettles, and kitchen "furniture, after my new invention."

"The vessel or plate must be clean, washed over with salarmo-"niack water, no other metal made use of but pure tinn, and "wiped off clean, and when cold it must be covered over with "wet whiting, and the other side with strong beef brine, and "made red hot, and quenched in water, and then scoured clean "off, tinned a second time as before, then planished in and tinned "a third time, then filled with water to soke and take out the "salts, and then scour it with common sand."

[Printed, 3*d*. See Rolls Chapel Reports, 6th Report, p. 160.]

A.D. 1768, November 8.—N° 905.

WHATELEY, GEORGE.—1st. A "method of plating silver upon "mettal wire, and drawing the same into wire of very fine sizes, "both round, flatt, and square, and of drawing the same so fine "as to make thread, lace, fringe, and tinsel."

An ingot of copper, or of an alloy of copper and brass, is drawn into round wire of considerable size; a sheet of smoothed rolled silver is then placed and fastened round the metal wire, incorporated therewith by means of borax and of the heat of a clear coal fire, allowed to cool gradually, and boiled in a solution of alum. The silver-plated wire is then drawn through several holes of the draw-plate, annealed, and alternately drawn and annealed until it is of the fineness required; it is then rolled between a pair of rolls. To make the round silver-plated wire square, it is drawn through a suitable number of square holes of a draw-plate, then annealed, and alternately drawn and annealed until the requisite shape and fineness is attained; in drawing the silver-plated wire the draw-plate is dressed with bees-wax.

2nd. A "method of plating gold upon silver wire, and drawing "the same into wire of the finest sizes, both round, flat, and "square, and of drawing the same so fine as to make thread, "lace, fringe, and tinsel."

Precisely the same process is adhered to as that described in the first part of this invention, silver being substituted for copper, and gold for silver.

[Printed, 4*d*. See Rolls Chapel Reports, 6th Report, p. 136.]

A.D. 1768, December 6.—N° 908.

WHATELEY, GEORGE.—The title of this invention is a "New-"invented method of plating gold upon silver-plated metal wire, "and of drawing such wire, when plated with gold, into wire of "very fine sizes, both round, flat, and square, and of drawing the "same so fine as to make thread, lace, fringe, and tinsel, and be "as useful in various branches of business and manufactories as "real gold wire thread, lace, fringe, and tinsel, and a great saving "and benefit to his Majesty's subjects."

The means of accomplishing the above object is exactly the same as that described in N° 905, in relation to plating silver upon metal wire and plating gold upon silver wire, the silver-plated metal wire being treated exactly the same as solid silver wire, and thus yielding a silver-plated wire with a gold covering.

[Printed, 3*d*. See Rolls Chapel Reports, 6th Report, p. 136.]

A.D. 1769, November 27.—N° 938.

ASHTON, JOSEPH.—"A method of casting and making of "coffin nails and tacks out of or from pig iron, commonly called "cast metal, and of tinning the same."

The nails are cast in iron, then annealed by a gradual heat. The method of tinning the above-mentioned nails and tacks is as follows:—

"Put such nails and tacks into a pickle made by me of an acid "spirit, commonly called or known by the name of mineral acid, "mixt with water, which will soften the scurf left on the nails "and tacks after casting and healing" [nealing?], "then scour "such nails and tacks by turning them about in a wooden barrel "for a sufficient time, which fits them for tinning, and then put "such nails and tacks over the fire in an iron vessel mixt with tin

" or pewter, and a sufficient quantity of sal ammoniac, and shake " such vessel about until the tin or pewter is compleatly spread " over such nails and tacks, and then after burnishing or lacker- " ing, or both if thought fit, of such nails and tacks, the same " are compleatly finished."

[Printed, 3*d*.]

A.D. 1770, August 10.—N° 967.

CRAWFORD, MAURICE.—This invention relates to coating copper with tin.

"The copper must be wrought in the common way till it is " ready for the first pickling. Then pickle it off in the common " way, after which it must be freezed in the inside upon stakes " cut as rough as a course" [coarse?] " file, or any other method " of freezing which opens the pores of the copper and makes the " tinning penetrate. That being done, the copper must be pickled " for the last time, and scoured clean on both sides. Then tinn it " with sal armoniack and grain tinn, and, when properly tinned " with that, take a mettle compounded of grain tinn and zink or " spelter, of the following proportions, viz.:—To each pound of " grain tinn add one pound and one half pound of zink or " spelter, or any other mettle of equal wholesomeness and " hardness, and with this mettle and sal armoniack tinn it well " over, and, when so tinned, scour the inside clean, and rough " plenish it on a bright stake. Then rub the inside with chalk " and water, so that the tinn comes clean; plenish and smooth it " hard, so as to bring it to a gloss. All pieces of work that " requires to be tinned on both sides, such as ladles, scummers, " &c., these must be freezed on a cutt stake with a cutt hammer, " or in such other manner as before mentioned, and dipped in the " melted mettle and finished as before mentioned. All nails " must be freezed and dipped likewise in the mettle."

[Printed, 3*d*. See Repertory of Arts, vol. 10, p. 397.]

A.D. 1778, March 20.—N° 1187.

COLLINS, WILLIAM.—The title of this invention is "A method " of preparing, gilding, polishing, and burnishing a metal (or " metals) plated with silver, for making buttons and other articles " in the toy way, both for use and ornament, by laying on the

" gold when the metal or metals plated are in a state of much " more considerable thickness than when they have been before " used for the purposes aforesaid."

The method of performing this invention is as follows:—" By " laying on the gold when the metal or metals plated with silver " are in a state of much more considerable thickness that" [than?] " when they have been before used, and afterwards by " rolling or extending the said metal or metals until they are " brought to the proper or usual size and thickness for the said " uses, and by passing such metal as is required bright thro' a " pair of rollers of my own invention, one of which, moving " slower than the other, gives the metal so roll'd a lustre superior " to any heretofore produced by the common method of rolling) " in which both rollers move in an equal degree."

[Printed, 3*d*.]

A.D. 1779, January 30.—N° 1209.

ELLIS, RICHARD.—A " New-invented method or mode of plating " steel or iron with gold or silver."

" That part of the steel or iron next where the gold or silver is " to laid on to be rub'd with borax; the gold or silver to be fitted " close. The different solders used for the above purpose are as " follows:—One ounce standard gold, four pennyweights fine " silver, and three pennyweights fine copper; one ounce fine " silver, and two pennyweights spelter; one ounce sterling silver, " and twelve grains copper, copper brass, or spelter; the solder " laid on as suits the different works. The particular art in " soldering depend on the care in firing it."

[Printed, 3*d*. See Rolls Chapel Reports, 6th Report, p. 164.]

A.D. 1779, August 10.—N° 1232.

TAYLOR, JONATHAN.—The title of this invention is " Casting " oval bellied cast iron potts, and nealing, turning, tinning, and " finishing the same, and also nealing, turning, tinning, and " finishing such kind of round cast iron potts and saucepans " as are made with a bead or rim round the top."

After setting forth the method of casting, annealing, and turning the oval pots, the Specification describes the method of tinning them in the following terms:—" The tinning and finishing " is performed by holding the pot to be tinned over the fire till it

" becomes of a regular proper heat to receive the tin, when a " proper quantity of grain tin mixed with sal ammoniac is put " into it, the pot being still kept over the fire, and the tin worked " about with sal ammoniac till it takes and adheres to the pot in " a proper manner."

The method of annealing and turning the round pots is somewhat similar to that of annealing and turning the oval pots; when, however, the round pots have a bead or rim round the top " the beads or rims round the tops " are tinned at the same time as the pots themselves, " and by the same method as pots or " saucepans are tinned."

[Printed, 3*d*. See Repertory of Arts, vol. 3, p. 231.]

A.D. 1783, January 20.—N° 1352.

TYLOR, JOHN.—Tinning or lining tea and coffee urns, and other copper vessels, whereby they are not liable to corrode, and are rendered " elegant, compleat, and useful."

The " new-invented inside or lining " is " made and prepared of " copper, or any other metal or composition, to fit the outward " case or body of the tea or coffee urn; " it (the lining) is then " *tinned and planished or plated* with any other metal or com- " position on the inside thereof; " or the said lining is " made of " copper, or of some metal or composition which has been already " *plated or covered* with silver." The lining, thus prepared, is then introduced into the outward case or body of the tea or coffee urn, and " fixed or soldered " therein; after this, the cock and other fittings are fixed and soldered into the urn.

The tinning or lining of the top, cover, or neck of the urn is done in exactly the same manner as the tinning or lining of the body of the urn.

It it especially stated that the " new-invented inside or lining, " after the same is tinned and planished bright or plated as afore- " said, do not (like the common method of tinning tea and coffee " urns) require to be heated in the fire, so as to injure such lining, " planishing, or plating, as aforesaid."

[Printed, 5*d*. See Rolls Chapel Reports, 6th Report, p. 167.]

A.D. 1785, February 26.—N° 1466.

PLAYFAIR, WILLIAM.—" Certain new methods of making " shoe, knee, stock, and other buckles, of silver or other metals,

" and of covering the surfaces of copper, or other metals, with " silver, gold, or mixtures of silver or gold with other metals, " which operation is commonly called plating."

Two methods of making the above-mentioned buckles are set forth in detail.

The " method of plating or of covering the surfaces of copper " or other metals with different allays " [alloys?] " of gold or " silver consists in in inserting a thin sheet or plate of the silver, " so much allayed with copper, that it will melt sooner than either " of the two metals that are to be united by the operation." For instance, a piece of copper of a certain size is smoothed and flattened; a thin piece of silver of the same size, considerably alloyed with copper, is likewise flattened and cleaned on both sides; a thicker piece of silver, containing less copper, is treated in a similar manner, one side only being cleaned; the copper has the thin silver plate laid upon it, and the thicker silver plate, with its clean side downwards, is placed on the top of the whole. The three pieces of metal, thus disposed, are then brought into contact by means of a hammer and anvil, bound together, and put into the furnace that is ordinarily used for plating with pure silver, " till the intermediate piece of silver appears to melt." The resulting plate is then treated in the ordinary way.

To plate the copper on both sides, the above operation has to be done to both sides of the bar at the same time."

[Printed, 3*d*. See Rolls Chapel Reports, 6th Report, p. 171.]

A.D. 1785, April 16.—N° 1472.

RAWLE, VALENTINE.—"Covereing the mitres, angles, or joints," of plated wares " with stronger plated metal or solid silver, as the " nature of the wares may require, and which invention is likewise " applicable to wares made round, oval, &c."

" When the candlestick (or other article) is tied together, or " brought to form a piece of plain silver, or strong plated metal, " it must be stamped in a die, or drawn in a swage tool, to give " it the form required. In the same method other swages are " raised, which is so well known by the manufacturers as not to " need an explanation; which swage must then be overlaid or " inserted in the joint, so as to compleatly cover it, which takes " of " [off?] " the friction from those acute angles to which they

" were before exposed to in cleaning; and from the thinness of " the edge of the swage, it is sure to lay close to the part, and " forms an additional strength to the article, not only as to shew, " but by holding the joints together, which before, if only a square " bent, and not soldered was considerably weaker than the other " parts, but a soldered joint was still weaker; this swage, being a " separate piece applied to it, gives another thickness to the part, " by which its strength and durability in every respect are im- " proved. This swage, after on, may be engraved or chased, if " required, tho' better plain, on account of cleaning, and may " be hard or soft solder'd, after the manner of other works."

[Printed, 3*d*.]

A.D. 1785, September 13.—N° 1496.

POULAIN, JOHN.—" A new composition of tinning or lining of " all utensils or vessells made of copper, brass, iron, or other " metals, especially those used for kitchen or culinary purposes."

The composition is made by fusing together certain proportions of tin, malleable iron, " platina," silver, gold, borax, and pounded glass; the whole is fused together in a crucible, and cast into ingots. To enable the composition to be fit for use, it is heated and pounded in a hot mortar; an ingot of it is then made by heating it, " in a mould made of iron plate," over the fire, well stirring it, and allowing it to cool."

To apply the composition.—After being tinned in the ordinary way, the utensil or vessell has a coat of the composition applied with " sal armoniack; " when the composition is well spread, it is allowed to cool. The vessel is then annealed by being plunged into cold water whilst red hot; the rough particles of the composition are scraped off, and the vessel is scoured with sand.

" The same operation must be repeated for every coat of the " composition that is applied. Two coats of the composition are " quite sufficient for culinary utensils or vessells, and a thin coat " of grain tin may be applied over the last coat of the composition " to smooth it."

[Printed, 3*d*. See Repertory of Arts, vol. 3, p. 12; 2nd Rolls Chapel Reports, 6th Report, p. 171.]

A.D. 1785, November 19.—N° 1511.

ALSTON, JAMES.—" Lining, edging, plating, and covering, " either in the whole or in part, with silver or gold, or otherwise,

" buckles and other articles made of iron, copper, or other " metals or mixt metals, by the use and application of tin or " alloyed tin."

The processes for accomplishing the above-mentioned objects are set forth in the Specification under the following heads:—

Process N° 1.—The chased blanks are first tinned all over very carefully; they are then plated either by "dipping" or "filling." If they are plated by "filling," the proper amount of tin is measured, so that by "proportioning the blanks, the silver, and " the tin to each other" any selvedge on the edges is avoided; the silver, it must be observed, is cut or pared "so close to the " impression given to it by the captain as exactly to fit the blank " it is to be plated upon."

Process N° 2.—The blanks are "French plated" (leaf silver burnished on whilst they are hot), then plated by "dipping" or " filling." "Hot silvering" may be used instead of "French " plating," if the blanks are made of an alloy of copper.

Process N° 3.—The edges of buckles, as well as the tops, are plated with the same piece of rolled silver. In making the " swageing stock," the "captain" is pressed down its whole thickness into the sand, and the sand is raised "on the outside as " high as the bridges." The "plating stock" cast upon this "swageing stock," "has a compleat rim all round its concave " impression of the captain." The silver is cut "sufficiently " large to cover over the edges and bridges of the buckle;" the top impression is swaged upon the captain, and squeezed between the two stocks. The silvers are then soldered on to the blanks, "either by dipping or filling, as before described."

Process N° 4.—The silver is impressed for the bottom and edges only, by being swaged upon a buckle laid upon a "plating stock " with an impression of the top only;" the said buckle, with the silver, being pressed into a "bottom stock," that has been cast upon the "plating stock," with the buckle (duly protected by clay) in it; the edges of the silver are then pared off, and the blank partially plated. The top silver (swaged, pared, and clayed) is then tinned over the inside by being drawn over melted tin, and plated on to the half plated blank by heating in a stove.

Process N° 5.—Plated buckles that are afterwards to be stamped, are "made of an equal thickness," by making the impression in the "plating stock," to "run exactly parallel with the face of the

" stock," and by freeing the bottoms of the blanks from lumps of metal. Fewer blows are required under the stamp, when a gentle blow is given at first with a stamp hammer. To plate the "bridges" of the buckle, a larger quantity of solder is allowed to surround the blank at suitable places, or the tin is forced up by pressure.

Process N° 6.—The blanks must be narrower and thinner than the original buckle, and have their bottoms clayed after being tinned. Both stocks being heated, the buckles are plated by "filling," the "bottom stock" being placed on as quickly as possible, and struck with some blows of a hammer. The success of this process is further ensured by a recess made between the two stocks to receive the superfluity of tin, by using the proper measure of solder, and by casting a handle of stout iron wire into the "bottom stock."

Process N° 7.—The buckle (clayed all over) and the silver intended to cover it, are laid between the two stocks; the bottom stock has an inlet for pouring in the solder, and a channel to receive the superfluity; the melted metal is then poured into the heated stocks, the "sprays" cut off, the silver (thus tinned) replaced in the plating stock, and the hot tinned blank placed upon the silver; by the help of glazier's solder and Venice turpentine the hot blank melts the solder, and becomes united to the silver. Another variation of this process consists in stamping the blanks "into the silver, without previously soldering them "together."

Process N° 8.—Two methods of stamping the blanks are set forth in detail.

Process N° 9.—Certain methods of giving "the impressions to "the silver plates before they are soldered to the buckle," are herein described.

Process N° 10.—This process is applied to blanks, "intended to "be afterwards plated on the tops," as a preparation to any of the foregoing processes. Silver or other leaf metal is burnished on to the roughened and cleaned blank by means of a steel burnisher. In some cases sufficient heat may be employed to enable the silver to unite with the nearly melted tin by slight pressure.

Process N° 11.—Buckles are covered with leaf metal by an intermediate coat of varnish. "Buckles plated on copper," are covered

at the edges and bottoms, either by means of an amalgam, by the use of corrosive sublimate, or by a hot soldering iron.

Process N° 12.—" Coat, breast, and vest buttons of sheet iron " are covered " with tin, silver, and gold, or otherwise," as follows :— The cleaned sheet iron is stamped red hot in a die, the selvedge is cut off, and the shanks fixed on. The buttons are put into an iron barrel which revolves on an axis over an open fire; when they are sufficiently heated to melt tin, the tin or pewter is added, together with some sal-ammoniac; the subsequent processes of burnishing and coating with metal are performed when the movement of the barrel backwards and forwards has enabled the buttons to become completely tinned. The tops of the buttons are inlaid with leaf metal by pressure into a recess, and subsequent burnishing. The bottoms of the buttons are covered with tinsel by the application of corrosive sublimate, heat, and solder to the said tinsel (properly cut out), and by applying the tinsel so heated and prepared to the heated buttons. Sheet tin, rolled steel, and tinned cast iron are also mentioned as being available for making the above-mentioned buttons.

[Printed, 8*d*. See Rolls Chapel Reports, 6th Report, p. 172.]

A.D. 1786, August 3.—N° 1551.

KERR, WILLIAM.—" A new method of intermixing and infusing " certain metallic substances into the body and pores of all sorts " of iron and steel and other metals, which prevents the pernicious " effects of air and moisture."

1st. " The metal intended to be prepared " is cleaned by immersion into a hot and weak solution of " spirits of salts," and is then (if necessary) filed.

2nd. " The composition to be infused into the metal " consists of certain proportions of grain tin, block tin, quicksilver, and (for fine work) brass filings.

3rd. The above composition is melted in a cast iron pan, and " the metal intended to imbibe it, is covered with rosin and " immerged therein " " till it has fully received the composition ;" it is then taken out " and well shaken to keep the composition " smooth on the metal, then sprinkled all over with sal ammoniaca, " which forces the composition into the pores of the metal, and is " there fixed by afterwards throwing the metal so prepared into

" cold water, and immediately taken out to cool, when the whole " process is perfect.

[Printed, 3*d*. See Roll Chapel Reports, 6th Report, p. 174.]

A.D. 1787, February 1.—N° 1586.

HICKMAN, ROBERT.—" A new method of making and manu- " facturing gilt and plated coat and waistcoat buttons, by uniting " or amalgamating with or by means of tin, or tin and lead " mixed, gilt and plated metal button shells, both coloured, plain, " and figured with bottoms of copper, brass, iron, mixed and " compound metals."

The sides of the bottoms on which the shells are to be laid are tinned by means of heat and sal ammoniac. When the shells are filled with tin the heated bottoms are slid upon them "by which " means the bottoms and shells become united and amalgamated." The buttons are then inlaid with " gold, silver, or any other metal," by means of dies, or they may be otherwise ornamented.

[Printed, 3*d*. See Rolls Chapel Reports, 6th Report, p. 178.]

A.D. 1790, March 31.—N° 1739.

COLLINS, WILLIAM, and WYATT, CHARLES.—" A new article " of trade and commerce, being an improvement of copper sheets " or plates and brass sheets or plates, by covering and combining " them with a metallic or semi-metallic substance, which covering " will prevent all noxious effects from those metals when used for " culinary purposes or for containing or conveying water, and " will also render them more useful to manufacturers."

The sheets to be coated, after having been cleaned, are immersed in the melted metal. The metal is melted in an iron vessel of sufficient size to admit either of the article being totally immersed, or of its being passed gradually through the melted matter. " Animal fat, or any other matter having the property of pre- " venting the calcination of the coating substance or of reviving " its calx, may be kept constantly thereon or added occasionally."

The metals, employed for coating the above-mentioned sheets or plates, directly stated in the Specification, are :—Lead, tin, the alloys of lead and tin, and " zink or any other semi-metal."

" If it be intended to place the sheets in a trough on a table or " in moulds, the melted matter must then be poured on them."

[Printed, 3*d*.]

A.D. 1790, July 8.—N° 1755.

WHITWORTH, JOHN.—This invention consists of "plating "silver upon pure or block tin, and of making or manufacturing "therewith, by a new mode, all sorts of silver plated goods or "wares usually manufactured from gold, silver, or other metals, "or metal plated with gold or silver."

A piece of flattened silver, cut to the pattern of the article intended to be made, is fixed in an iron frame, the rim of which is "in the shape or form of the silver when so cut." The silver is fixed tight in the frame "by the pressure of the rim thereof on "the edges of the silver, so that the tin, when melted or fluxed "thereupon, cannot run from out the frame." To flux the tin upon the silver, thus fixed, a proper quantity of tin, cut into small pieces, is laid upon the silver; the frame is then heated over a fire and placed "in a level position until the tin is become set or "hardened."

When it is requisite that the metal should be plated on both sides, two of the above-mentioned plates are fluxed together over the fire.

The Specification and Drawings set forth, in detail, the application of this invention to making a knife handle. A sheet, plated on one side only, is bent round an iron mandril and soldered at the joint; it is then forced into a hollow block of iron, so that the surface of the resulting knife handle may be smooth.

[Printed, 6*d*. See Rolls Chapel Reports, 6th Report, p. 144.]

A.D. 1794, July 22.—N° 2002.

HAND, JOHN.—"Plating cutlery goods in general."

The blade, or other article to be plated, is prepared by hardening, tempering, filing, grinding, or in any other suitable manner, then brightened and cleaned in acid.

When the silver plate is to be soldered to the said blade, a quantity of tin solder is melted, and the blade dipped in "sal "armoniac" water, covered with rosin, and put "into the melted "solder, taking care to spread the solder all over it." The article is then put into "sal armoniac" water, rinsed, dried, and filed.

The silver plate is annealed, cleaned, covered with "sal armoniac "water, sublimate water, or any other water or thing that has a "tendency to make the solder flush," which is dried on; the silver plate is then cut to "a proper shape to fit that part of the

" article it is to plate," and beaten so as to fit quite close to the said article.

The Drawings show a pair of pliers or tongs with two pieces of copper brazed on to the inside, so that the article, with the silver covering, may be enclosed between the said pieces of copper. To solder the silver on, the article is placed in the tongs, the pieces of copper having been heated just sufficient to melt the solder and no more. The article is pressed close whilst still hot; the silver coating is then scoured, cleaned, dried, hammered, smoothed, and polished.

[Printed, 5*d*.]

A.D. 1816, August 3.—N° 4050.

POOLE, JOHN.—The title of this invention is " Brass and copper " plating, or plating iron or steel with brass or copper, both plain " and ornamental, and working the same into plates, bars or " other articles."

The iron or steel to be plated is cleaned, then rubbed with a solution of sal ammoniac; " the surface of the brass or copper " intended to be laid upon the iron or steel " is rubbed with a solution of borax. The iron (or steel) and copper (or brass) pieces are packed into a pot with the prepared sides in contact, sand or cement being used to keep them in their proper places; the pot, with its contents, is then put into a furnace and subjected to " a " gradual and progressive heat until the brass or copper is fluxed " or melted upon the iron or steel;" when the pot is cool the plating is finished. These plated metals are then rolled or beaten into plates, sheets, bars, beadings, &c., so as to enable any required article to be manufactured therefrom.

When a thin coating of brass or copper is required, the iron or steel is prepared with sal ammoniac and borax (as described above), heated nearly red hot, dipped into melted brass or copper, and the superfluous copper or brass thrown off by striking the coated metal with a hammer.

The ornament or design is first made in the iron, and the superposed brass or copper is worked " so as to shew the brass or " copper plated in the original impression;" or the brass or copper may be taken off by filing, &c., so as to show the iron or steel underneath.

[Printed, 3*d*. See Rolls Chapel Reports, 8th Report, p. 120.]

A.D. 1816, August 3.—N° 4053.

DAYMAN, JOHN.—"A method of covering or coating iron, "steel, or other metals or mixtures of metals."

The apparatus used in carrying out this invention "may be "described in general terms to consist of a mold or molds of a "proper substance," which has no affinity with the metal it is intended to receive, "in which the metal intended to be coated, "after being duly prepared" by tinning or in any other suitable manner, "is to be secured, leaving a space or spaces open equal "to the intended thickness and shape of the coating, which mold "or molds is or are to be plunged in a vessell of melted metal of "the sort intended for the coating, and there continued until the "open space is filled and all the air bubbles have escaped."

The Specification and Drawings describe and show an apparatus for coating pipes, tubes, and pumps, also an apparatus for coating flat sheets of iron or other substance. In the apparatus for coating pipes, &c., the outside cylindrical case is preferably made in two parts, and a separate bottom and top is fixed, fluid-tight, on to the cylindrical case; a core of metal, or other suitable material ("of "the size of the intended internal coating") fits into the bottom and goes through a hole in the top. In the apparatus for coating flat sheets, two flat sides of the mould (having suitable flanges and screws) enclose the piece of metal intended to be coated, spaces being left between the sheet of metal and the sides of the mould equal to the thickness of the coating required on each side of the said metal to be coated.

[Printed, 6*d*. See Repertory of Arts, vol. 31 (*second series*), p. 263; also Rolls Chapel Reports, 8th Report, p. 116.]

A.D. 1817, June 10.—N° 4134.

PARNALL, JOHN.—This invention is entitled an "Invention "and improvement of tinning, or covering with tin, sheets or "plates of copper, brass, or zink."

The process, set forth in the Specification, is as follows:—

The sheet of copper, brass or zinc is pickled in a solution of "spirits of salts or marine acid," put into an air furnace ("to "raise a scale"), struck upon an iron plate (to beat the scale off), passed through a pair of case-hardened iron rolls, and placed in "lees of fermented bran," in which it must remain twenty-four

hours. The said sheet of copper, brass, or zinc is then pickled for four hours in weak "vitriolic acid," rinsed, cleaned, "and " dipped into a pot of melted tin with tallow grease, or any other " more fit fat material on the top, through which the sheet of " copper, brass, or zink passes to the tin; or otherwise, without " tallow, grease, or any other more fit material on the top of the " tin, when the quality of the copper, brass, or zink makes it " unnecessary. After this the sheet of copper is dipped, if re- " quired, into a second tin or wash pot filled with melted tin, and " then into a pot of grease to take off any knob of tin that may " have collected, and make the covering of tin of a smooth " surface. The sheet is then taken and rubbed clean with bran, " and after this it is passed through a pair of case-hardened high " polished iron rolls, when it becomes fit for use."

[Printed, 3*d*. See Repertory of Arts, vol. 32, p. 140.]

A.D. 1817, December 5.—N° 4182.

TURNER, JOHN.—In this Specification the claim is for "The " improvements of plating copper or brass, or copper and brass " mixed with pure or standard gold, or with gold mixed with a " greater portion of alloy, so that when plated it may be rolled " into sheets."

The following is the method of accomplishing the above-mentioned object:—Ingots of copper or brass are cleaned, and their surfaces are made as level as possible; plates of gold, or of alloy of gold, are then prepared in the same way as the ingots. A plate of gold (prepared as described above) is placed on an ingot; these are compressed together by hammering, and bound with wire. A mixture of silver filings and borax is then laid "upon and along " the edge of the piece or plate of gold, and next to the ingot of " metal, so that the said mixture of silver and borax or other salt " may lie and rest upon the edge or between the edges of the piece " or plate of gold and the ingot of metal." The two metals, thus prepared, are heated "until the adhesion or combination of the " gold with the metal is perfect." The plated ingot is then ready for rolling into sheets.

The adhesion of the gold to the copper may also be effected " without the assistance or the use of any portion of silver mixed " with the borax or salt, by merely using other kinds of solder."

It is, however, preferred to use the silver and borax, as above stated.

[Printed, 3*d*. See Repertory of Arts, vol. 34 (*second series*), p. 10; also Rolls Chapel Reports, 8th Report, p. 127.]

A.D. 1820, May 13.—N° 4459.

KENRICK, SAMUEL.—"An improved method of tinning cast "iron vessels of capacity."

This invention "consists in a new method of suddenly cooling "and setting tin, or other fusible metals mixed with tin, upon cast "iron vessels, by the application of a rapid current of air to the "coating of tin, or other fusible metals mixed with tin, whilst in "a state of fusion."

Having cleaned the external and internal surfaces of the vessel, the internal surface is covered with melted tin by the usual process; that process being, the pouring melted tin into the vessel, causing it to adhere by the application of sal ammoniac, and plunging the vessel, whilst still hot, into water, with its mouth upwards. The vessel is then dipped into melted tin, and thus (using sal ammoniac) is tinned both inside and out; it is then exposed, without loss of time, to the action of a rapid current of air, which suddenly sets the tin upon both surfaces of the vessel. The method described in this Specification is said to be so far superior to that in which water was used as the cooling agent, that vessels can be tinned both inside and out, whereas, by means of water-cooling they could only be tinned on one side at a time.

The Specification and Drawings describe and show apparatus for cooling an "alehouse pint measure." The measure is placed, immediately after having been tinned, in a vessel with which a compressed air reservoir communicates. The air is prevented from impinging directly on the measure by means of a screen or "tray."

[Printed, 7*d*. See Repertory of Arts, vol. 40 (*second series*), p. 335; also London Journal (*Newton's*), vol. 2, p. 427.]

A.D. 1820, December 9.—N° 4515.

DOBBS, THOMAS.—"A new mode of uniting together or plat-"ing tin upon lead."

1st. To cover leaden pipes with tin.—A thin coating of tin is first given to the hot leaden pipe by rubbing it over with tow impregnated with tin and turpentine, both inside and outside. A

thicker coating of tin is then given by enclosing the pipe in a mould, and putting a core through the centre of the pipe; the vacancies respectively between the pipe and the mould and between the pipe and the core, determine the thickness of tin coating the leaden pipe, melted tin being poured into the mould for that purpose. The coated pipe is then ready for drawing or rolling.

2nd. To tin ingots of lead on one side.— A plan is used exactly similar to that employed to cover leaden pipes. The mould is, however, suited to the shape of the ingot, and has a vacancy for the reception of the tin coating, on one side of the ingot only.

3rd. To tin ingots of lead on both sides.—A precisely similar plan to those above set forth is adopted; the mould has, however, a vacancy left on each side of the ingot to receive the tin.

4th. To tin lead sheeting.—Melted tin, and afterwards some melted resinous substance, is poured upon a hot sheet of lead and rubbed over the said sheet, "with a greasy rag or hurd or other "similar soft substance," until the lead sheeting is completely tinned; such tin as may not have adhered is then wiped off. Another method is to put the cold tin upon the lead in a small piece, and to flush it on the lead by the help of heat and resin.

[Printed, 3*d*. See Repertory of Arts, vol. 38 (*second series*), p. 207; also London Journal (*Newton's*), vol. 2, p. 89; also Engineers' and Mechanics' Encyclopædia, vol. 2, p. 57; also Rolls Chapel Reports, 7th Report, p. 122.]

A.D. 1821, August 3.—N° 4598.

POOLE, JOHN.—"Plating iron or steel with brass or copper."

To plate a sheet or ingot of iron with brass on one side only.—A shallow, flat-bottomed, cast-iron pan is provided; the said pan has sloping sides, a ledge all round the bottom, several small feet cast on to it, and is coated with whiting and water. An ingot or plate of brass, of the size of the bottom of the pan within the above mentioned ledge, cleaned on one side, "and of such a thickness as "that, when fused or melted, it may rise a little above the said "ledge or projection," is placed in the pan, and above it, resting on the ledge, a clean sheet of iron is laid. The iron is weighted so as to keep in contact with the ledge when the brass is melted. The whole, thus arranged, is then placed "in a reverberating furnace" having a flat and level bottom. The pan is then taken from the furnace and placed with its feet in cold water. When the metals are sufficiently cooled, the process is finished.

To plate a sheet or ingot of iron on both sides with brass.—An arrangement similar to that already described is used; an additional plate of brass is, however, laid on the top of the iron plate, and on the top of that a cast iron lid is placed. The said lid has a notched projecting ledge all round it, which is equal in depth to the thickness of plating required.

To plate round or square iron bars with brass, an exactly similar arrangement to that above described is used, except that the pan is suitably fluted longitudinally, and has suitably placed ledges. The cover is also made to correspond with the pan.

To plate ornaments of brass upon iron, a plain pan is used, the design is sunk into the iron, and the superfluous brass is ground or filed off.

[Printed, 7*d*. See London Journal (*Newton's*), vol. 3, p. 237.]

A.D. 1822, August 24.—N° 4698.

MITCHELL, WILLIAM.—Plating by means of hydraulic pressure.

This invention "consists in the application of a water press, "such as is known by the name of Brahma's press, in the manufac- "ture of gold and silver plate, and plate of other ductile metals, "for the accomplishment of what has heretofore been effected in "a less perfect manner by the screw press and by percussion."

Two cast iron blocks, of the same diameter as the ram or piston, are employed; the lower block rests on the piston, the upper one is "fitted to the shoulder of the press, and attached to it by a bolt "passing through to the top of the frame of the press." "To "form a sufficient resistance to the dies employed in the manufac- "ture when the press is in operation," two circular pieces of steel are used; these are ground into the above-mentioned blocks.

"In applying the said water press to the manufacture of plate," dies are employed, "such has have been hitherto used in the "manufacture of plate." The metal is cut into suitable shapes and applied to the dies, "the impression required is completed by "a single operation of the press, and without having recourse to "annealing or softening the metal."

[Printed, 5*d*. See London Journal (*Newton's*), vol. 6, p. 74.]

A.D. 1823, September 11.—N° 4845.

SPRIGG, JAMES, the elder.—The title of this invention is "A "certain improvement in the manufacture of grates, fenders, and "fire-iron rests."

The inventor states:—"My said improvement in the manu- "facture of grates, fenders, and fire-iron rests consists in the "application of the process commonly known by the name of "close plating to the grates, fenders, and fire-iron rests them- "selves, as well as to the other parts added to them, whether for "use or ornament, such as the beads or mouldings, the concaves "or convexes, the pateras, the cables, rolls, or other stripes used "in the manufacture of register and other stoves and fire grates, "as also for dogs, hearths, and other grates for burning wood or "any other fuel, or whether heated by any other artificial means, "likewise to the feet, paws, claws, or balls used to support fenders "of whatever description of form or pattern, as also to the "fire-iron rests themselves, and to their various decorations, and "which said close plating I perform with rolled silver, soldered "upon iron or steel (previously tinned) by means of an alloy of "tin with lead, or other fit and proper metal, to make it flow the "better when in fusion, to produce a more perfect adhesion of "the iron or steel to the silver."

[Printed, 3*d*. See London Journal (*Newton's*), vol. 7, p. 64.]

A.D. 1824, December 18.—N° 5057.

ROBERTS, SAMUEL.—This invention "consists in a new mode "of preparing for and putting on the ornamented silver edges "upon those plated articles on which such edges are introduced."

This "improved method is, after filing the edge of the article "to nearly the shape (but somewhat less) of the ornamented "indented silver edging, to hard-solder a silver thread of the "required strength upon the said edge, and then to flat it with a "hammer upon a metal stake to the breadth and strength re- "quired, and so as that the outer edge will extend a little beyond "the ornamented silver edge, which is then to be soft-soldered "on in the usual way. The projecting part of the hard-soldered "silver edge which extends beyond the ornamented silver edge "is then to be filed off, and the two edges burnished together till "the joining disappear."

[Printed, 3*d*. See Repertory of Arts, vol. 4 (*third series*), p. 181; also London Journal (*Newton's*), vol. 11, p. 26.]

A.D. 1825, February 26.—N° 5111.

GORDON, DAVID, and BOWSER, WILLIAM.—"Certain improvements in uniting and plating or coating iron with copper "or with any other composition whereof copper is the principal "ingredient."

Two furnaces are constructed close together and with suitable appliances. In one of these, iron, with a clean surface, is brought to a welding heat, the ordinary atmosphere being completely excluded and only burnt air admitted; in the other furnace a suitable amount of copper is melted, also out of contact with the ordinary atmosphere. "When the copper is at or near to that "degree or pitch of heat known to copper melters as giving the "greatest subsequent degree of toughness to the copper," a sliding door is opened, thus establishing a communication between the two furnaces, and the iron is plunged into the melted copper.

According to a modification of the process above described, the melted copper is poured over the heated iron, each having been heated out of contact with the ordinary air, and the said pouring taking place as much as possible out of contact with air.

To copper plates of malleable iron on one side only, two plates are perfectly united at their edges only, and in that condition are immersed into the melted copper. Plates of iron have their edges turned up so as to form a tray, and are made (when of a welding heat) to float upon the melted copper. A great thickness of copper is attached to one side of a wrought-iron plate by pouring the melted metal into one of the before-mentioned trays; or the tray may be held, bottom downwards, in the melted copper.

Many details of the furnaces and processes are given.

[Printed, 5*d*. See Repertory of Arts, vol. 3 (*third series*), p. 193; also London Journal (*Newton's*), vol. 12, p. 89.]

A.D. 1826, December 8.—N° 5426.

DICKINSON, ROBERT.—This invention "consists in the con-"struction of certain hollow vessels, such as tanks, barrels, casks, "and packing cases of sheet or rolled iron, coated or covered "with a certain composition or alloy of metals and other "materials."

A wrought iron vessel, for keeping provisions, is first described at length in the Specification, and shown in the Drawings; its

peculiarity is that it has a moveable head or cover capable of being fixed on air-tight.

The method of preparing the preservative coating and applying it to the iron plate is as follows:—"The iron plate, either before "or after being made into vessels, is prepared in the usual method "for tinning, by removing the oxided surface by the action of "dilute acid, in the way well known to workmen, and is then "immersed in melted tin, according to the ordinary process." The surface is then covered "with an alloy or mixture of metals "and other matter," composed of certain proportions of tin, zinc, finely powdered glass, and borax; bismuth, lead, &c. may be introduced into the alloy. "The second or even subsequent "coatings of the compound metal are applied over the surface of "tinned iron in the way commonly followed in the application of "the first coating of pure tin, the plates or vessels being im-"mersed in a quantity of the fused alloy." A coating of pow-"dered glass and linseed oil may be afterwards applied.

[Printed, 6*d*. See Repertory of Arts, vol. 5 (*third series*), p. 373; Register of Arts and Sciences, vol. 2 (*new series*), p. 73; London Journal (*Newton's*), vol. 1 (*second series*), p. 38; and Engineers' and Mechanics' Encyclopædia, vol. 1, p. 150.]

A.D. 1829, September 9.—N° 5843.

MORGAN, THOMAS.—"A new method of manufacturing or "preparing iron plates or black plates for tinning."

This invention consists of a process "of clearing instead of "scaling iron or black plates in the course of preparing them for "tinning, and previous to their being cold rolled and annealed, "whereby the iron lost in the scaling is saved, and a better "article produced at a cheaper rate."

The bar from which the iron plates are to be made is finished between smooth finishing grooves in the bar rolls, and is immediately plunged into cold water "to clear off the scale." When the bar is heated to enable it to be rolled into plates it is not to be overheated. "In cutting the edges of such plates as are in-"tended to be annealed together in a box or case," "care should "be taken to make them square or true, and of equal size, so "that they may be placed evenly in the box, and none of their "edges projecting beyond the rest." The plates are then "cleared" by being pickled in weak sulphuric acid, washed,

dried quickly, cold-rolled, and annealed. The annealing process may either consist of steeping the plates in dilute muriatic acid and heating them in an open furnace, or of enclosing them in an iron box tightly during the application of heat. After annealing the plates are pickled or "cleared" and scoured in the usual way prior to their being tinned.

[Printed, 4*d*. See Repertory of Arts, vol. 9 (*third series*), pp. 229 & 263; London Journal (*Newton's*), vol. 5 (*second series*), p. 218; Register of Arts and Sciences, vol. 4 (*new series*), p. 132; and Webster's Reports, vol. 1, p. 737.]

A.D. 1830, July 26.—N° 5963.

ROBERTS, SAMUEL.—"Certain improvements in plating or "coating of copper, or brass, or mixture of the same with other "metals or materials, with two metals or substances upon each "other; as also a method of making such kind of articles or "utensils with the said metal when so plated as have hitherto "been made either entirely of silver, or of copper, or brass, or of "a mixture of copper and brass, plated or coated with silver "solely."

This invention "consists in introducing a layer of German "silver or other white or light-coloured metal between the silver "and copper (or copper and brass) usually constituting plated "metal. By this means, whenever the silver is partially or wholly "worn off, the defect will scarcely be perceptible. This may be "done either by first plating the copper ingot with the white "metal, in the same manner that it is usually plated with silver, "and then afterwards laying a coating of silver, in the same "way, upon the white metal; or the white metal and the silver "upon it may at one process be both united in the usual way to "the copper."

"In plating for wire, a cylinder of the white metal may be "plated in the usual way with silver, and then slipped upon a "round ingot of copper or copper and brass, and the whole "drawn through wortles in the usual way; or the white metal "may be first plated upon the copper ingot, and afterwards the "white metal plated with silver in the common way.'

[Printed 3*d*. See London Journal (*Newton's*), vol. 8 (*second series*), p. 24; and Register of Arts and Sciences, vol. 5 (*new series*), p. 165.]

A.D. 1833, January 24.—N° 6371.

WARNER, JOHN, the younger (*a communication*).—This invention "consists in a certain mode of coating lead pipes, tubes, "cylinders, sheet lead, and other leaden articles of commerce, "with tin or alloys of tin."

A bath of melted tin or alloy of tin is prepared, of a suitable form and size. "The heat of this bath should be so regulated "that the said metal or alloy shall continue in a fused state, but "not at a higher temperature than is necessary for that purpose, "lest the lead, when immersed, should be melted thereby."

The external and internal surfaces of the article to be covered with tin are coated with rosin or "with a mixture of oil and rosin "boiled together." "The pipe or other article so prepared are "then to be passed through or immersed in the bath of melted "tin, which latter should be kept covered with fat, oil, rosin, or "other suitable article, to prevent the oxydation of the fluid "metal, and to aid in the tinning."

When the articles are to be only partially tinned, those parts which are not to be tinned are covered "with a mixture of lamp "black and size."

[Printed, 8*d*. See London Journal (*Newton's*), vol. 3 (*conjoined series*), p. 209; also Engineers' and Mechanics' Encyclopædia, vol. 2, p. 797.]

A.D. 1836, March 8.—N° 7018.

MERRY, ANTHONY THEOPHILUS.—This invention consists "in the application of German silver, and similar alloys of nichel" [nickel?] "plated with fine silver, to the manufacture of what "are commonly called plated goods."

An ingot of German silver has the part intended to be plated cleaned and smoothed by filing, scraping, or otherwise. Rolled silver is then scraped or cleaned on one side, cut rather less than the metal to be plated, "and placed the scraped or clean side "upon the bright or filed metal." The metal with the silver so placed is put on an anvil and struck with a sledge or stamp hammer, there being a thick piece of iron or steel (with a flat face) upon the silver; when the silver is thus flattened, and is made to touch the surface of the metal all over, a piece of flat copper is cut the size of the silver, whited (with whiting and water) on one side, and placed with the whited side upon the silver. The whole is bound with binding wire, borax is applied

round the edge of the silver, the metal is placed in the fire of a plating stove until the silver flushes round the edge, then it is removed from the fire with care, held level until the silver has set, passed through rollers with "a great pinch," and, lastly, rolled "in the usual way of plating metals."

[Printed, 3*d*. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 122.]

A.D. 1836, June 24.—N° 7134.

ELKINGTON, GEORGE RICHARDS.—This invention "consists "in gilding copper, brass, and other metals or alloys of metals by "means of potash or soda combined with carbonic acid, and "with a solution of gold."

The process consists in dipping the articles to be gilt into a boiling solution which contains gold; the articles are then washed and coloured.

The solution is made as follows:—Fine gold is dissolved in dilute nitro-muriatic acid by the aid of heat, the heat being continued after all the gold is dissolved, "and until a reddish or "yellowish vapour ceases to rise;" to the solution of gold, distilled water and bicarbonate of potash are added, and the whole is allowed to boil for two hours.

"The articles to be gilded having been first perfectly cleaned "from scale or grease they are to be suspended on wires conve- "niently for a workman to dip them in the liquid." "The time "required for gilding any particular article will depend on circum- "stances, partly on the quantity of the gold remaining in the "liquid, and partly on the size and weight of the article."

"A dead appearance" is produced on the article during the cleaning process, and before immersion in the above-described solution, by means of "deading aquafortis"; another method consists in applying a weak solution of nitrate of mercury to the articles previous to gilding; a third method is to dip the gilded articles into nitrate of mercury, and to heat them until the mercury is expelled.

"Much of the beauty of the result depends on the well cleaning "of the articles," before they are gilt.

[Printed, 3*d*. See Repertory of Arts, vol. 8 (*new series*), p. 223; also London Journal (*Newton's*), vol. 10 (*conjoined series*), p. 99.]

A.D. 1837, February 17.—N° 7304.

ELKINGTON, HENRY.—1st. Improvements in coating certain metals with platinum. The metals are dipped into a solution which is made as follows:—To a solution of platinum in nitro-muriatic acid a certain quantity of water, of bicarbonate of soda, and bicarbonate of potash is added, the whole being boiled; a small portion of solution of gold in nitro-muriatic acid is then added; platinum is deposited "apparently in a non-metallic state" by means of this solution. A solution that deposits platinum in a metallic state is formed by adding certain quantities of water, of bicarbonate of potash, and of platinum solution to a solution of gold in nitro-muriatic acid; the platinum solution being small in quantity.

2nd. Improvements "in gilding certain metals, which are to be "first coated with platinum, by a solution of gold." When the articles have been coated with platinum in its metallic state, they are transferred to a strong solution of gold in nitro-muriatic acid, "and allowed to remain therein until sufficiently gilt;" the articles may then be coloured by the usual process. Ornamental work may be gilt in parts, either by suitably applying the gold solution with a brush, or by covering the parts not to be gilded with varnish or lacquer and, when this is dry, dipping the said articles into the solution of gold, the lacquer is then removed by a suitable solvent. Palladium may be used for the first coating instead of platinum.

3rd. "A method of gilding certain metals by means of solution "of gold and a solution of mercury." The gold solution consists of a strong solution of gold in nitro-muriatic acid; the mercurial solution is made by dissolving mercury in nitric acid, adding to a small quantity of this solution a certain amount of water and carbonate of potash, and boiling the whole "until the potash is "dissolved." The cleaned articles are then dipped into the boiling solution of mercury and potash, washed, dipped into the gold solution, and this process is repeated until the articles are sufficiently gilt; the articles are then whitened all over by immersion into a strong solution of mercury and potash and, finally, they are heated over a clear fire until all the mercury is expelled.

4th. "Improvements in apparatus" used for the above-mentioned or similar processes. This apparatus "consists of a boiler

" and condenser for evaporating in vacuo the waste waters with " which the gilded articles are washed after they are taken out of " the solution of gold and potash, and thereby rendering the " gold and potash contained in such waters in a fit state for use." The object for evaporating such waters in vacuo is to prevent the precipitation of gold which has been found "to take place when " gold is boiled at a high temperature with a dilute solution of " potash."

[Printed, 6*d*. See Repertory of Arts, vol. 8 (*new series*), p. 354; also London Journal (*Newton's*), vol. 18 (*conjoined series*), p. 246.]

A.D. 1837, April 29.—N° 7355.

CRAUFURD, HENRY WILLIAM (*a communication*).—This invention relates to coating iron and copper with zinc, in order to preserve the said iron and copper from oxidation. The coating of zinc may, in some cases, be covered with a second coating of tin, or an alloy of tin.

The cleansing process.—The iron or copper is cleaned by immersion in weak sulphuric acid heated in a leaden vessel, thrown into cold water, scoured with sand and cork, and rubbed with a brush.

Another scouring process consists in immersion in sal ammoniac, or in muriatic acid solution, and drying.

To coat large articles with zinc.—After being cleansed they are immersed gradually in melted zinc, the said zinc having "its " surface covered with sal ammoniac or any flux;" they are then drawn out slowly, thrown into clean water, rubbed, and dried.

To coat small pieces of metal with zinc.—In order to detach the excess of zinc with which they are coated by immersion in melted zinc, they are placed in a reverberatory furnace, covered with charcoal, and maintained at a red heat; the mass is then shaken about until the zinc becomes set.

"Galvanic paint.—The galvanic paint having the property of " preserving iron and copper from oxydation is composed of zinc " powder well ground and mixed with the substances generally " employed for painting."

Second coating with tin.—The pieces of metal are moistened with a solution of sal ammoniac or with a solution of muriatic acid, then dipped rapidly into melted tin and drawn out slowly.

The fused metal must be very hot, and must be covered with a layer of fat or tallow.

In a "Disclaimer and Memorandum of Alteration," enrolled June 14th, 1839, the "galvanic paint" is disclaimed; also the second coating of tin. In the sentence "The zinc being melted " it must be skimmed carefully, and its surface covered with sal " ammoniac or any flux," it is proposed to leave out the words " or any flux." The invention is thus restricted " to the mode of " coating copper and iron for the prevention of oxydation by " immersing the same in melted zinc."

In a "Disclaimer," enrolled September 2nd, 1848, the same points as those above mentioned are disclaimed. The invention is thus restricted " to the mode of coating copper and iron for the " prevention of oxydation by immersing them in melted in zinc, " having its surface covered with sal ammoniac."

[Printed, 5*d*. See Repertory of Arts, vol. 9 (*new series*), p. 289; London Journal (*Newton's*), vol. 12 (*conjoined series*), p. 65, also vol. 24 (*conjoined series*), p. 457, also vol, 21 (*conjoined series*), p. 478, for disclaimer; Hindmarch on Patents, pp. 293 & 430; and Rolls Chapel Reports, 7th Report, p. 186.]

A.D. 1837, December 4.—N° 7495.

BOOKER, THOMAS WILLIAM.—"Improvements in preparing " iron to be coated with tin and other metals."

1st. The dilute sulphuric acid used is heated "in such manner " that the heat can be more uniformly kept than when heated by " the direct action of a fire."

2nd. The sheets of iron are submitted " in such manner to the " action of the pickling liquor as to insure their being kept " separate, notwithstanding a number of plates are in the pickling " trough at one time, the sheets being put into the pickling " trough one at a time."

The heating of the pickle is accomplished by interposing a medium, such as water, between the fire and the pickling liquor. For this purpose an exterior vessel, placed over the fire-place, contains an interior leaden vessel in which the pickle is put; water is poured into the space between the two vessels.

The plates are kept separate by placing them in " grates of lead or " wood or other material not prejudicially acted on by the acid," those "grates" being immersed in the acid.

The process is as follows:—The acid is mixed in the leaden vessel, the fire lighted, and (when the water between the vessels begins to boil) the plates are dropped into the grates one by one. When the plates are clean, they are thrown into cold water, from which they are taken when wanted for tinning, &c.

[Printed, 6d. See Repertory of Arts, vol. 10 (*new series*), p. 80.]

A.D. 1837, December 4.—N° 7496.

ELKINGTON, HENRY.—1st. Improvements in gilding certain metals. The processes described in the Specification consist of dipping the cleansed articles into certain boiling solutions.

A solution for gilding copper and its alloys is made by precipitating the gold from a solution of gold in nitro-muriatic acid, by means of a solution of silver in nitric acid, and then dissolving the said precipitated gold by adding a solution of chloride of sodium. This solution is made fit for use by adding certain proportions of chloride of sodium and "borax (borate of soda)." The gilding is rendered paler by the addition of chloride of silver to the above solution. Another solution for gilding copper and silver is prepared by dissolving gold in a mixture of nitric acid and chloride of sodium, and adding a certain proportion of borax, chloride of sodium, and water to the said gold solution.

In gilding silver, after using the above-mentioned solution, the article is transferred to another solution, only differing from the first by its containing a certain amount of nitrate of potash and of alum.

In gilding iron or steel, borax and nitrate of potash or chloride of sodium are dissolved in the gold solution.

In gilding zinc, "the solution of gold prepared with borax only" is employed; the solution is used dilute and with a large proportion of borax.

A gilding solution for red gilding is prepared as follows:—If the first-mentioned solution is used, certain proportions of muriate of ammonia and bichloride of mercury, or corrosive sublimate, are added thereto. If the last-mentioned solution is employed, certain proportions of muriate of ammonia, carbonate of ammonia, and bichloride of mercury are added thereto.

2nd. Improvements in silvering certain metals, also involving the dipping of the cleaned articles into certain boiling solutions. For common articles a solution of chloride of silver in muriatic

acid is used; this process gives a thin coating. For the better class of goods, a solution containing chloride of silver, muriate of ammonia, and bichloride of mercury is preferred; the mercury is afterwards expelled by heat, and the articles quenched in dilute muriatic acid.

3rd. A method of glazing the inner parts of metal vessels used for the above-mentioned and other purposes. An inner coating is given to the vessel by means of a mixture of carbonate of potash or soda, pipe-clay, sand, and water. After the vessel is coated with the above-named mixture, it is "set aside that the coating "may dry slowly," and, when quite dry, it is submitted to a red heat; the vessel is thus coated with a vitreous coating. An outer glaze (applied upon the inner coating) is given to the vessel by means of a mixture of powdered glass or enamel with clay, and by fusing the glaze or outing coating on to the said inner coating.

[Printed, *4d.* See London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 75.]

A.D. 1838, July 24.—N° 7742.

ELKINGTON, GEORGE RICHARDS, and BARRATT, OGLETHORPE WAKELIN.—Certain methods of "coating metals with "zinc, and with zinc and mercury, for the purpose of preventing "oxydation, and a mode for coloring iron and steel."

1st. To coat copper and brass with zinc.—The articles are immersed in a boiling solution of chloride of zinc, which contains "a quantity of zinc in powder or in thin pieces"; it is important that the articles be brought into "contact with the metallic zinc," when "they will speedily become coated therewith"; the said articles are then washed and dried.

2nd. To coat iron and steel with zinc.—In using the above-described process to articles of iron or steel, they are first coated with copper by immersion in a solution of sulphate of copper. A second process consists in introducing the coppered articles into a dilute solution of nitrate of mercury, and boiling them in the zinc solution; this process is also applicable to articles of copper. A third process consists of immersing the iron or steel into dilute muriatic acid, in which there is a quantity of zinc in powder or small pieces, the said iron or steel being in contact with the zinc during the process; the articles are then washed and dried.

3rd. To coat iron, steel, copper, brass, &c. with the amalgam of zinc.—Amalgamated zinc has dilute acid added to it, and the metals are immersed in the solution thus formed, the said metals being in contact with the amalgamated zinc during the process; other acids than the muriatic may be employed, likewise certain salts, as the muriate or sulphate of ammonia. For some articles the amalgam of zinc is employed in a melted state.

All the above-mentioned processes may be used in the case of iron tinned or zinced by fusion; or they may be employed previous to the coating by fusion.

4th. "To colour iron and steel to imitate brass."—The iron or steel is coated with copper, then with zinc, and is afterwards submitted to the action of heat in a closed oven, until the required colour is obtained; the articles are then pickled, washed, and dried. The heating of the iron articles is said to be similar to a process called "semiloring (*simile l'or*)," hitherto practised for copper and brass.

[Printed, 4*d*. See London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 79.]

A.D. 1840, February 29.—N° 8403.

NEILSON, JAMES BEAUMONT.—Certain improved methods of "coating or covering iron, to prevent oxidation or corrosion, or "for other purposes, by means of copper or alloys of copper."

The copper is used in "that minute state of division in which "it is obtained by precipitation from its solutions;" or it may be used granulated, or in very small pieces. "The alloys also must "be used in a very minute division, gromulated" [granulated?] "or in very small pieces." The salts of copper, or of the metals with which it is alloyed, may be used instead of the finely divided metal.

"To apply the coating to cast iron, cover the surface of the "mould in which the iron is to be cast with any of the materials "above described, of which the coating is intended to be formed," "In dry sand or loam moulds the coating powder or substance "should be mixed with wet charcoal powder, and spread over the "surface of the mould." The resulting casting will be found covered with copper or with the alloy required.

"To apply the coating to malleable iron, whether a bar, sheet, "plate, or other article, the coating substance mixed with a small

" quantity of dried borax or other well-known flux is spread " over the upper surface of the iron, or such part of it as it is " intended to coat, and it is then placed in a furnace heated to a " temperature sufficient to melt copper, or the alloy which may " form the substance of the coating;" the copper or alloy is thus fused on to the iron. "The bar, sheet, plate, or other article of " iron, is then removed from the furnace, and while hot plunged " into cold water to detach the scale of oxide which forms " upon it."

[Printed, 3*d*. See Inventors' Advocate, vol. 3, p. 147.]

A.D. 1840, March 3.—N° 8407.

SHORE, JOSEPH.—This invention "relates to a mode of ob- " taining or applying a permanent covering of copper or of nickel " by means of galvanic batteries on articles manufactured of " wrought or cast iron, tin, lead, & copper, and of alloys of " such metals, such covering acting as a preservative to some of " those metals and alloys of metals, and in other cases as a " superior surface."

A single cell arrangement (without a separate battery) is used for this purpose; weak sulphuric acid and zinc is placed in one compartment, and a solution of sulphate of copper or nitrate of nickel, and the object to be coated in the other. On connecting the zinc in one compartment with the article in the other compartment by means of a wire, the galvanic current circulates and the article begins to be coated. "The longer the articles are " under operation the thicker the covering."

To clean the articles prior to the operation of coating.—It is preferred to heat the articles by placing them in a crucible, " covering them with sand, charcoal, blacklead or other suitable " powdered substance, and then raising the crucible and its con- " tents to a low red heat." When the crucible is cool the articles " will be found in a good condition for the process."

[Printed, 3*d*. See Repertory of Arts, vol. 14 (*new series*), p. 353; London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 82; and Inventors' Advocate, vol. 3, p. 163.]

A.D. 1840, March 25.—N° 8447.

ELKINGTON, GEORGE RICHARDS, and ELKINGTON, HENRY.—1st. "Coating metal with silver by fusing the coating

"surface." The metal (already coated with silver) is immersed into a hot solution of nitrate of silver, and submitted "to a "temperature sufficient to expel all the acid, and leave a merely "metallic coating of silver."

The article is then placed in fused borax (the borax being "of "sufficient heat to melt silver") until the perfect fusion of the silver is effected, cooled by immersion in cold water, and the adhering borax dissolved off by dipping into boiling dilute sulphuric acid. To finish the silver surface, the article may either be annealed and boiled in dilute acid, or it may be electro-coated slightly, as herein-after set forth.

2nd. Coating certain metals with silver by the use of a silver solution only, also by means of a solution of silver in connection with a galvanic current. The solution consists of oxide of silver dissolved in a solution of "prussiate of potash (cyanide "of potassium)"; this solution is used boiling. The same solution may be used cold when electric force is employed. The galvanic current is applied by means of a single cell arrangement. Other solutions are specified, but the above are preferred.

3rd. Coating certain metals with gold by the use of a gold solution only, also by means of a solution of gold in connection with a galvanic current. A boiling solution of gold or oxide of gold in "prussiate of potash" [cyanide of potassium?] is preferred for the dipping solution, and a cold solution of the same materials for the electro-depositing solution.

4th. Cleaning iron, so as to render it fit to be coated with copper or other metals; the said coating to be by electric or other means. The iron is kept "in an electro-negative state during the "period of the action of the cleaning acid upon it." The iron articles to be cleaned are electrically connected with a piece of zinc, and are then immersed into dilute sulphuric acid. The iron articles are then immersed in a brass vessel (so as to touch the said vessel) which contains an acid solution of sulphate of copper; they are thus firmly coated with a thin film of copper, and may then receive a further covering of copper or other metals by the usual way of applying galvanic currents for that purpose, or they may be coated by other known means.

[Printed, 5*d*. See Repertory of Arts, vol. 16 (*new series*), p. 239; London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 83; Mechanics' Magazine, vol. 33, p. 397; and Inventors' Advocate, vol. 3, p. 228.]

A.D. 1840, August 15.—N° 8604.

FONTAINEMOREAU, PIERRE ARMAND le Comte de (a *communication*).—"Certain improvements in covering and coating "metals and alloys of metals."

1st. Gilding.—The cleansing process consists of heating the articles to a red heat, and pickling them in weak sulphuric acid; they are then brushed, dried, and thrown into a bath containing sulphuric and nitric acid, "to give them a fine color." When, by a subsequent use of nitric acid, they are of "a fine yellow "color," they are washed, dried, scratch-brushed, and burnished. Silver articles are "red heated," "thrown into an acidulated "bath," taken out as soon as they are white, rubbed with wet sand, washed, and dried.

The basis of the dipping solution is either bromide, chloride, or iodide of gold. To form the "first bath" the basic solution is added to a solution containing certain proportions of distilled water, barytes, and strontia; "for the articles of silver they must "be covered with a copper wire, or they will not gild." The "second bath" consists of certain proportions of the basic solution, "common water," and lithia. The "third bath" contains the basic solution and certain proportions of lime, magnesia, and either chloride of calcium or chloride of magnesium; this solution is particularly recommended for gilding iron articles. The "fourth bath" contains the basic solution and certain proportions of oxide of zinc and chloride of zinc. In the "fifth "bath," the dissolved gold is precipitated by means of oxide of zinc; the precipitate is then boiled with certain proportions of distilled water and of chloride of barium, or of the chloride of strontium or chloride of zinc, or chloride of lime, or chloride of magnesium. There are thus five different methods of gilding, but it is preferred to use the first bath.

2nd. Silvering.—A solution of nitrate of silver, or of "any "other salt of silver," is added to certain proportions of water and of chloride of barium, or chloride of strontium, or chloride of sodium, or chloride of lime, or chloride of magnesium, or chloride of zinc; cream of tartar and "boric acid" [boracic acid?] are also added; thus the dipping solution is formed.

3rd. Coating metals and alloys with platinum.—A solution of chloride or bromide of platinum is added to certain proportions

of distilled water and chloride of barium; either of the following may be substituted for chloride of barium:—chloride of strontium, chloride of lime, chloride of magnesium, chloride of zinc, or chloride of ammonium; this forms the dipping solution.

[Printed, 4*d*. See Mechanics' Magazine, vol. 34, p. 175; also Inventors' Advocate, vol. 4, p. 132.]

A.D. 1840, August 27.—N° 8610.

LOCKETT, JOSEPH.—The title of this invention is "Certain "improvements in manufacturing, preparing, and engraving "cylinders, rollers or other surfaces for printing or embossing "calicoes or other fabrics;" in some of these improvements galvanic electricity is used to give a permanent metallic coating to the metallic surface of the cylinder or to a portion thereof.

The improvements are:—

1st. "Recoating, covering, or thickening" the above-mentioned cylinders, &c., or making new cylinders, by electro-depositing copper upon metal or metallized surfaces. When the cylinder is formed by coating a metallic surface, the original surface or "mould" is quite adherent to the deposit, and is "retained as a "portion of the cylinder." When the mould is composed of a non-conducting substance, it is removed from the deposited metal, when the said deposit "has attained the requisite thickness."

2nd. When any portion of the engraved part of a cylinder has to be rendered plain according to a given design, those portions only are electro-coppered, the engraved parts to be retained being stopped out with varnish.

3rd. "A simple mechanical contrivance, to be applied either to "the ordinary slide lathe or the engraving machine commonly "used for cylindrical engraving, for the purpose of cleaning, filing, "or turning off the superfluous portions of the copper thus de-"posited upon rollers or cylinders and reducing the prominences "of the deposited or raised portions on the surface to an evenness "or level with the other portions of the cylinder."

[Printed, 10*d*. See London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 89; Mechanics' Magazine, vol. 34, p. 221; and Inventors' Advocate, vol. 4, p. 150.]

A.D. 1840, September 17.—N° 8634.

RICHARDSON, WALTER, and BRAITHWAITE, GEORGE MOTT.—"Improvements in tinning metals."

"The invention relates to combining nickel and iron with tin, " in order to improve the tinning of metal surfaces."

"The temperature at which nickel is fusible being higher than " that required to bring tin into a state of fusion, it is necessary " to prevent the tin, as it melts, from evaporating; and as it is " essential, in order to effect the admixture that these two metals " be put into the same crucible," this object is attained by adding to the composition certain proportions of borax and powdered glass. The crust formed by the borax and glass "on the one " hand prevents the tin from evaporating through the effect of " the high temperature necessary to effect the fusion of the nickel, " and on the other hand impedes the action of the air on the " metals in fusion. The fusion of the three metals is completed, " and their perfect admixture effected, in the space of about half " an hour, when it is then only necessary to make a hole in the " crust formed by the borax and the glass, and thus run it off."

The compound of tin thus formed is applied to the metal to be coated in the same manner and with the same facility as ordinary tinning.

[Printed, 3*d*. See Repertory of Arts, vol. 16 (*new series*), p. 111; Mechanics' Magazine, vol. 34, p. 251; and Inventors' Advocate, vol. 4, p. 197.]

A.D. 1840, November 3.—N° 8677.

EMMERSON, RICHARD FARGER.—" Coating the surfaces of " wrought-iron welded tubes and cast-iron tubes with tin, or " alloy of tin."

The interior and exterior surfaces of one of the above-mentioned tubes being clean, it is immersed "into a bath composed of mu- " riatic acid and zinc, or spelter," "the zinc or spelter being dis- " solved by the acid;" one end of the tube is passed under the liquor, and moved forward into the vessel containing the liquor, " so that a stream will pass through the tube;" the tube is then passed "out at the other end of the trough or vessel to that at " which it was first introduced."

The interior and exterior of the tube is then covered with powdered rosin, and the tube passed through melted tin or alloy of tin in a similar manner to that used in passing it through the solution of zinc. When, upon the tube being wiped with tow, it is found that any of the parts are defective, the whole process is gone through again.

"The short tubes or fittings for such welded iron and cast iron " tubes" may be treated in like manner in order to coat their surfaces.

[Printed, 3*d*. See Repertory of Arts, vol. 16 (*new series*), p. 173; also Inventors' Advocate, vol. 4, p. 308.]

A.D. 1841, March 8.—N° 8865.

SPENCER, THOMAS.—"An improvement or improvements in " the manufacture of picture and other frames and cornices, ap- " plicable also to other useful and decorative purposes."

1st. "Manufacturing picture and other frames of copper," by means of the electrotype process.

2nd. Manufacturing moulds, for casting "composition," papier mâché, and other ornaments, by means of the electrotype process."

3rd. "Making patterns or moulds for ironfounders in copper," by means of the electrotype process.

4th. Electro-gilding solutions. The first consists of a solution of gold in bromine, or in a mixture of bromine, alcohol, acetic acid, and sulphuric acid; in the latter case electric force is used to dissolve the gold; when a thick deposit is required, acetate of ammonia is added to the solution, and, when the metal to be gilt acts on the solution, bi-carbonate of soda is added thereto. The second solution consists of iodide of gold dissolved in certain proportions of boiling water and acetate or muriate of ammonia, or the iodide of gold may be dissolved in "prussiate of potassa" and boiling water.

5th. Electro-silvering solutions. One solution consists of silver dissolved in acetate of ammonia by the aid of electric force. In a second solution, silver is dissolved by means of electricity, in bromine and alcohol; the resulting precipitate is dissolved in acetate of ammonia. "A solution may be formed, for the above " purposes, of iodine and silver, by dissolving an iodide of silver " in prussiate of potassa, or any of the ammoniacal salts."

6th. Electro-platinizing solutions. "Platino-bichloride of am- " monia" is added to a certain proportion of water acidulated by muriatic acid. A second solution is formed by dissolving platinum in muriate of ammonia by means of electricity. In a third solution, spongy platinum is dissolved in an alcoholic solution of

bromine, to which dilute sulphuric acid is afterwards added. A fourth solution consists of bichloride of platinum and ammonium dissolved in an alcoholic solution of bromine.

A dissolving plate of platinum is used in all cases.

The above-described solutions may be used to platinize lead plates that are intended to be used as negative battery plates.

7th. Electro-tinning. The electro-depositing solution contains "acetate of ammonia or muriate of that salt or suphate" [sulphate?] "of soda."

8th. Cleaning iron surfaces and electro-coppering them. A solution of sulphate of soda in connection with a galvanic battery is the means adopted for cleansing; the quantity and intensity of the electric force used is carefully proportioned to the size of the surface to be cleaned. Another cleansing solution, not used in connection with a galvanic battery, consists of a solution of sulphate of zinc containing "a very small portion of any salt of "copper." The electro-coppering solution "may be the acetate, "sulphate, nitrate, or the ammonia acetate of copper."

9th. "A method of producing enriched surfaces" applicable to the above purposes.

10th. "Improving the texture of composition used to cast "ornaments" for the above purposes.

[Printed, 8*d*. See Repertory of Arts, vol. 16 (*new series*), p. 287; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 166; Mechanics' Magazine, vol. 35, p. 282; and Inventors' Advocate, vol. 5, p. 180.]

A.D. 1841, March 29.—N° 8905.

PARKES, ALEXANDER.—This invention is entitled "Certain "improvements in the production of works of art in metal by "electric deposition," and it relates to "the manufacture of "works of art of silver and of gold, by causing these metals to be "deposited by electric agency in or on suitable moulds or "models," "which may be removed from the articles of gold or "silver when the same have been formed."

The following is the only part of the Specification which relates to coating metals permanently with metals:—"Having produced "the article desired in gold or in silver, if it be a bust or figure "or ornament, and requires to be of greater strength than it is "desired to obtain by a thickness of gold or silver, I strengthen "the article by causing a deposit of copper or other metal by

" electric means within the article of silver or gold, or I fill the " article of gold or silver with fusible metal or other material."

[Printed, 7*d*. See Repertory of Arts, vol. 17 (*new series*), p. 199; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 171; Mechanics' Magazine, vol. 35, p. 315; and Inventors' Advocate, vol. 5, p. 227.]

A.D. 1841, August 11.—N° 9045.

BROWN, SAMUEL.—" Improvements in the manufacture of " metallic casks or vessels, and in tinning or zincing metal for " such and other purposes."

This invention relates:—

1st. To a " mode of fixing the heads or ends of casks or other " vessels by immersing the ends of such vessels in a bath of " suitable melted metal."

2nd. To an " improvement of the apparatus used for tinning " or zincing sheets of metal." The metal is kept in a melted state in a cast-iron vessel by means of its own furnace and flues; a " hot plate " is also heated by a furnace and flues appropriated to that particular purpose; the Drawings show the same chimney belonging to both. " In tinning sheets of metal which may be of " large dimensions, the workman having cleansed the surfaces by " pickling and otherwise, as is well understood, places the sheets of " metal in a trough containing powdered rosin, and then passes " them one at a time into the bath of melted metal, and allows " them to remain immersed for from five to ten minutes, and if " on raising a sheet of metal to the surface any part or parts are " not found to be coated, he is to throw on powdered rosin and " to rub it on to such parts as are not coated, and again immerse " the sheet in the bath, and when he finds, on examining a sheet " of metal, that it is coated all over, he is to withdraw it from the " bath and place it on the hot plate; then, by means of tow he " is to wipe off the superfluous metal, first from one side and " then from the other; the hot plate keeping the coating metal " melted on the surfaces, to allow of that operation."

[Printed, 1*s*. 6*d*. See Mechanics' Magazine, vol. 36, p. 143.]

A.D. 1841, September 8.—N° 9077.

BARRATT, OGLETHORPE WAKELIN.—" Certain improvements " in the precipitation or deposition of metals."

1st. " The application of electric currents for the purpose of

" depositing copper and its alloys taken into solution in the acids " employed during the process of cleaning such metals." A solution of the above description, saturated with copper and mixed with certain proportions of water and acid, is submitted to galvanic action, the work to be cleaned being in electric connection with the copper or negative plate of the battery, and a plate or plates of copper in electric connection with the other battery plate. The latter plate or plates of copper "receive the metal " deposited from the solution."

2nd. Electro-deposition of zinc. The solution used is a solution of metallic zinc in dilute sulphuric acid. The zinc in the battery and in the solution is not amalgamated; if, however, amalgamated zinc be used in the battery, the positive or dissolving plates in the solution are also amalgamated. The muriate or acetate of zinc, or the solution of zinc in muriate of ammonia, or " the sul- " phute " (sulphate?) " of zinc of commerce," may also be used as electro-depositing solutions.

3rd. Electro-deposition of copper upon iron. The first method consists of immersing the articles to be coated (connected electrically with a sheet of zinc) into an acid solution of sulphate of copper; the zinc plate is enclosed " in a wrapper of cloth or " strong paper to prevent the deposition of the copper upon the " zinc plate." The second method consists in the use of a depositing solution containing cyanide of potassium and cyanide of copper; in this solution the cyanide of sodium or the carbonates of potash or soda may be used instead of the cyanide of potassium.

Brass may be deposited upon iron by electro-depositing zinc upon the coppered iron, and then applying heat.

4th. Covering metals with platinum. A zinc plate is connected with the article to be coated, and the whole is immersed into an acid solution of platinum. A second method consists in using a solution containing " muriate of soda," alum, cream of tartar, and platinum; this solution may be used with or without the assistance of electric force.

Similar processes may be employed to coat metals with palladium.

5th. "A mode of precipitating copper from waters of copper " mines and other waters containing copper." Electric force is used to effect the said deposit; a porous vessel or partition con-

taining iron and a solution of muriate of soda is placed in a pit containing the cupreous solution; the iron is then electrically connected with sheets of copper or other metal in the cupreous solution, "which are to receive the deposit of pure metal."

6th. "Precipitating gold, silver, or platinum on to other metals "by employing the sulphuret of gold, or of silver, or of platinum, "when dissolved in hydrate of potash, with or without the aid of "a galvanic or other battery."

7th. "Precipitating alloys of metals when in solution on to "articles of metal immersed in such solution." The electro-depositing solution used, consists of certain proportions of the sulphurets of the metals dissolved in a solution of cyanide of potassium. "An anode of an alloyed metal of the same propor- "tions as is in solution" is used.

[Printed, 4*d*. See Repertory of Arts, vol. 17 (*new series*), p. 367; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 438; and Mechanics' Magazine, vol. 36, p. 476.]

A.D. 1841, December 9.—N° 9167.

TALBOT, WILLIAM HENRY FOX.—"Improvements in coating "or covering metals with other metals, and in coloring metallic "surfaces."

1st. To deposit "silver, gold, or platina" upon other metals. To a solution of silver, gold, or platinum, a solution of gallic acid (in water, ether, or alcohol) is added; the resulting solution may be used with or without the assistance of electric force.

2nd. "A method of silvering metallic surfaces." The solution employed is made by dissolving "freshly precipitated chloride of "silver in hyposulphite of soda, or any other liquid hyposul- "phite;" this liquid may be used as a dipping liquid, or electric force may be employed to obtain a thicker coating.

3rd. "A method of ornamenting surfaces of brass or copper, by "first gilding them partially according to some pattern, and then "washing them over with a solution of chloride of platina, which "has no action on the gilt parts, but gives a dead black appear- "ance to the rest of the surface, thus enhancing the brilliancy of "the parts which are gilt."

4th. "A method of coloring polished surfaces of copper by "exposing them to the vapour of sulphuretted hydrogen, or of "any of the liquid hydrosulphurets, or to the vapours of sulpher,

" iodine, bromine, or chlorine, or by dipping the metal into liquids " containing them."

[Printed, 3d. See Repertory of Arts, vol. 1 (*enlarged series*), p. 47; London Journal (*Newton's*), vol. 21 (*conjoined series*), p. 357; Mechanics' Magazine, vol. 36, p. 496; and Engineers' and Architects' Journal, vol. 5, p. 358.]

A.D. 1842, June 1.—N° 9374.

LEESON, HENRY BEAUMONT.—1st. Improvements in galvanic batteries.

2nd. Cleaning zinc and copper battery plates. Mercury is electro-deposited upon the zinc plates by means of a " solution of mercury " and potassium." The copper plates are first cleaned in dilute sulphuric acid by being made the anodes of an electro-depositing arrangement, and are then electro-coated with copper in the usual way by means of a solution of sulphate of copper.

3rd. Certain exciting fluids for galvanic batteries.

4th. " Improvements in the mode of applying the galvanic " current."

5th. " Improvements in the method of manufacturing works of " art and other articles " by means of electrotypy.

6th. To obtain a smooth electro-deposited surface. Either motion is communicated to the article receiving the deposit, or the electrolytic fluid may be agitated.

7th. The formation of specula. The metal forming the face of the mirror is first electro-deposited on a suitable mould, and then a sufficient thickness of copper to give strength is electro-deposited upon the first coating. Finally, the face is highly polished.

8th. The electro-deposition of alloys. The first method consists in using as many distinct galvanic batteries as there are metals to be deposited; all the cathodes are connected to the article to be covered, and each anode with one of the metals; the solution is " composed of similar salts of the different metals to be deposited." A second method consists in alternating the battery connection with the metals. A third method consists in using a mixed solution, " and connecting a cathode plate of each of the metals form- " ing the alloy to the anode of the battery." " A fourth mode " consists in the use of any of the non-metallic electrotytic " [electrolytic ?] " fluids " described in the 11th part of the invention, " in connection with any of the herein-before recited " arrangements."

9th. Preparing metallic surfaces for electro-deposition by first giving them a slight coating of metallic mercury. The articles are dipped into a solution of "cyanide of potash and mercury."

10th. "Arranging the articles themselves in a series as a por- "tion of the battery," "so as to assist in generating and main- "taining the galvanic current."

11th. Electro-depositing certain metals "without the aid of a "solution originally containing such metal as a component part." Any solution capable of forming a soluble compound with the metal to be deposited may be employed, and sufficient intensity of electric force must be used.

12th. "Manufacturing, extracting, or obtaining platinum and "other metals from their respective ores," by means of electro-deposition.

13th. Manufacturing platinum articles by means of electro-deposition.

14th. Certain electrolytic solutions. About 430 compounds "not heretofore proposed to be used" are set forth.

In a "Memorandum of Alteration" enrolled March 25th, 1843, "sulphite of silver" is substituted for "sulphate of silver," "sulphite of soda and silver" for "sulphate of soda and silver," "sulphite of potassa and silver" for "sulphate of potassa and "silver," "hyposulphite of silver and strontia" for "hyposul- "phate of silver and strontia;" also the words "racemate" and "sulphovinate" are substituted for the words "racinate" and "sulphorinate." The errors just enumerated occur in the description of the 14th improvement.

[Printed, 2*s*. See London Journal (*Newton's*), vol. 22 (*conjoined series*), p. 292; Mechanics' Magazine, vol. 38, p. 59; and Record of Patent Inventions, vol. 1, p. 353.]

A.D. 1842, June 4.—N° 9379.

TUCK, EDMUND.—This invention is entitled "Certain improve- "ments in the covering or plating with silver various metals and "metallic alloys."

The improvements consist "in the use and application of either "of the two carbonates of ammonia (namely, the sesquicarbonate "and the bicarbonate) as one of the ingredients in the mixtures or "compounds employed for covering or plating with silver various

" metals and metallic alloys by the action of electricity." " By the " use of the said carbonates the silver so deposited, and consti- " tuting such covering or plating, has not a crystalline character, " and is firmly adherent to the surface of the metal." To coat or plate common German silver a solution containing bicarbonate of ammonia and sulphate of silver is used; but for plating on copper or on good German silver the solution consists of a mixture of bicarbonate of ammonia with cyanide of silver. In using these solutions an anode of zinc is employed.

[Printed, 4*d*. See London Journal (*Newton's*), vol. 22 (*conjoined series*), p. 458; also Record of Patent Inventions, vol. 1, p. 373.]

A.D. 1842, August 1.—N° 9431.

WOOLRICH, JOHN STEPHEN.—" Improvements in coating " with metal the surface of articles formed of metal or metallic " alloys."

These improvements consist " in the employment of a magnetic " apparatus in combination with metallic solutions."

The " magnetic apparatus " consists of a magneto-electric machine, in which a horseshoe-formed armature revolves in front of a fixed horseshoe permanent magnet. A " dividor," or cylindrical commutator, is used to enable all the currents to flow in one direction.

The silvering solution consists of sulphite of silver dissolved in excess of sulphite of potash; oxide of gold dissolved in excess of sulphite of potash forms the " gilding liquor;" and carbonate of copper dissolved in excess of sulphite of potash constitutes the " coppering liquor."

[Printed, 10*d*. See Repertory of Arts, vol. 1 (*enlarged series*), p. 210; London Journal (*Newton's*), vol. 22 (*conjoined series*), p. 460; and Mechanics' Magazine, vol. 38, p. 145.]

A.D. 1842, August 10.—N° 9441.

STURGES, RICHARD FORD.—" A certain improvement in the " manufacture of Britannia metal and *plated wares*."

This invention " relates to those articles which are or may be " made of the alloy commonly called Britannia metal, or of other " metals or alloys, coated or covered with silver, such as tea " and coffee services, urns, candlesticks, trays, waiters, &c."

This invention " consists of preparing *the entire external* surface

" of all such articles as are or or may be made of Britannia metal " or plated metal, in such a manner that they present the appear- " ance commonly called by the names 'frosted,' 'grassed,' " 'matted,' and 'dead,' instead of the usual polish or burnish, " and do not require finishing by buffing, handing, or burnishing." This appearance may be produced in various ways; the mode preferred "is by means of dies."

The surfaces of articles thus prepared "require no other finishing " than washing either with soap and water, or with sand or " whiting and water, or with alkalies or acids dissolved in water; " and when, by use or otherwise, such articles have become " tarnished or discolored, they may be restored to the original " appearance by washing with soap and water."

[Printed, 3*d*.]

A.D. 1842, November 25.—N° 9528.

TALBOT, WILLIAM HENRY FOX.—1st. "Preparing the sur- " face of metallic articles intended to be gilt" by first covering them with a thin coating of silver. "A weak solution of silver in " hyposulphite of soda" may be used as the dipping liquid.

2nd. "Preparing the surface of articles intended to be gilt or " silvered, by causing them to give off hydrogen." For this purpose the cleaned article is attached to the negative pole of a voltaic battery, and plunged into any liquid that does not contain metal in solution, the positive pole being also immersed in the said liquid; the article is then immediately submitted to the action of the gilding or silvering solution, and washed in pure water. By the repetition of this process the thickness of the gold or silver coating may be increased.

3rd. "Employing a mixed solution of gold and one of the " baser metals (with the exception of mercury) for the purpose of " gilding metallic articles." A solution containing chloride of gold and hydriodate of zinc is preferred.

4th. "Using a solution of chloride of gold, mixed with a solu- " tion of boracic acid, for the purpose of gilding articles of brass " or other metal."

5th. Nitrate of mercury, in solution, is used to brighten imperfectly gilt articles; the excess of mercury is then removed "by " voltaic action."

6th. "Coating articles with a thick coating of gold or silver by alternately immersing them into different solutions; the assisting solution may be of a different metal, and its action may be increased by means of a galvanic current.

[Printed, 3*d*. See London Journal (*Newton's*), vol. 23 (*conjoined series*), p. 378; Mechanics' Magazine, vol. 39, p. 31; and Engineers' and Architects' Journal, vol. 5, p. 358, also vol. 6, p. 303.]

A.D. 1843, January 21.—N° 9641.

BLACKWELL, BENJAMIN BRUNTON, and NORRIS, WILLIAM.—This invention "consists of subjecting iron nails, screws, "nuts, bolts, and other articles made of iron, to be coated with "copper by galvanic means, after the articles of iron have been "first case-hardened, or previously coated with lead or an alloy "of lead."

The method of case-hardening preferred is as follows:—After the scale is removed, the articles are placed "with a portion of "parings of hoof or horn, or bone dust, in a crucible or iron box "well luted," and subjected to a red heat. "A very thin film of "case-hardened surface" is most conducive to the end in view.

The method of coating the iron articles with lead, or an alloy of lead, is to dip the cleaned articles into the molten metal precisely in the same manner "as is known and practised for covering iron "with tin."

"After receiving this first coating, the iron goods are ready to "be placed in a solution of copper, and in the circuit of a gal-"vanic battery, to receive a coating of copper; and it is much "better if the goods be placed in the battery while yet hot from "the first operation."

[Printed, 3*d*. See Repertory of Arts, vol. 3 (*enlarged series*), p. 363; London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 16; and Mechanics' Magazine, vol. 42, p. 108.]

A.D. 1843, May 4.—N° 9720.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improved "processes for coating metals."

The articles to be coated are first tinned by means of a solution of a salt of tin, then immersed into the molten metal of which the final coating is to consist, for example, tin, lead, zinc, or their alloys.

A tank containing a weak solution of chloride of tin is

sprinkled with granulated zinc, so that the bottom of the said tank is covered therewith. If plates have to be coated, alternate layers of plates and granulated zinc are placed in the tank. After some time, according to the strength and temperature of the solution, the work is perfectly tinned, and may then be removed to the bath of molten metal.

In the vessel of molten metal "a pair of rollers, together with a "back roller," is constantly kept revolving. The effect of this arrangement is, that when a plate is introduced into the molten metal, between the pair of rollers, it is drawn forward by their revolution; it then falls upon the back roller, and "is so far "curved that its end finds its way out at the surface of the molten "metal." It is then taken hold of with a pair of tongs, and drawn out of the bath. "In place of using two rollers, as above "explained, one roller, or simply a bar may be used for causing "the plates as they are introduced below the metal to be insured "descending to the same extent below the molten metal."

Oil or fatty matter, in combination with chloride of zinc and sal ammoniac, is used to cover the surface of the molten metal.

[Printed, 1*s*. See Repertory of Arts, vol. 2 (*enlarged series*), p. 353; London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 37; and Mechanics' Magazine, vol. 39, p. 369.]

A.D. 1843, May 25.—N° 9741.

POOLE, MOSES (*a communication*).—"Improvements in the "deposition of certain metals, and in apparatus connected there-"with."

Silver solutions.—Carbonate of soda and carbonate of silver are added to a dilute solution of hyposulphite of soda or potash. In working this solution, free hyposulphite and carbonate of soda are added from time to time.

Another solution may be prepared by boiling the above-described solution "for one hour; during which time, a portion of "silver is precipitated and the hyposulphite changes, forming a "new and distinct salt."

Gold solution.—"The gold" is precipitated by "liquor ammo-"niac" from a solution of gold in nitro-muriatic acid; the precipitate thus obtained is dissolved in a solution of hyposulphite of soda (or potash) by boiling.

Copper solution.—Carbonate of copper is dissolved in distilled

water containing certain proportions of hyposulphite of soda (or potash) and carbonate of soda.

All the above-mentioned solutions are to be worked by means of electric force.

A thermo-electric battery is described in the Specification and shown in the Drawings, consisting of alternations of German silver and iron rods. This battery may be used in connection with the above-described or other solutions.

[Printed, 5*d*. See Repertory of Arts, vol. 3 (*enlarged series*), p. 6; London Journal (*Newton's*), vol. 24 (*conjoined series*), p. 14; and Mechanics' Magazine, vol. 40, p. 14.]

A.D. 1843, June 15.—N° 9786.

BARRATT, OGLETHORPE WAKELIN.—"Certain improvements "in gilding, plating, and coating various metallic surfaces."

1st.—A voltaic apparatus applicable to the deposition of metals. Lead is the positive metal, carbon the negative element, and a solution of chloride of sodium the exciting liquid.

Another battery is formed with zinc, carbon, and water. Plumbago crucibles are preferred as negative elements.

2nd.—"Obtaining electricity continuously from the magnet." Any number of fixed magnets are connected by means of iron wire, the south pole of the first to the north pole of the second, "the south pole of the second to the north pole of the third, and "so on, to any number that it may be necessary to use." The work to be coated is suspended in the decomposition vessel from a copper wire attached to the north pole of the first magnet; an iron wire attached to the south pole of the last magnet carries the supply metal in the decomposition vessel. The wires at the north poles are placed at the ends of the magnets, but those at the south poles are placed some distance from the ends, according to the power required.

3rd.—"The dissolving of the metals." The solvent solution contains nitrate of potash, chloride of sodium, and sulphate of alumina and potash; the metal to be electro-deposited is dissolved in this solution by electrolysis. Chloride of sodium, hyposulphite of soda, or cyanide of potassium may be used to dissolve silver in. Chloride of sodium and boracic acid, or chloride of sodium and tartaric acid, may be used as solvent solutions.

[Printed, 4*d*. See London Journal (*Newton's*), vol. 24 (*conjoined series*) p. 28.]

A.D. 1844, February 21.—N° 10,063.

PARKES, ALEXANDER.—"Improvements in the manufacture of "certain alloys or combinations of metals, and in depositing "certain metals."

[No Specification enrolled.]

A.D. 1844, June 8.—N° 10,222.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improve- "ments in coating iron with other metals."

1st. Coating articles of cast iron with tin or other metal, by casting the said articles "in metal moulds," and then coating them "with molten metal."

2nd. "A mode of treating articles of iron before submitting "them to molten metal to be coated." The said articles are dried "in an atmosphere of vapour, such as will exclude as much "as possible the presence of atmospheric air." An iron trough, containing suitable racks to receive the articles, has a layer of sal ammoniac placed at the bottom; when the sal ammoniac is heated (by means of a fire under the trough), it gives off vapour, "so as "to fill the trough to the exclusion of the atmosphere;" the before-mentioned articles are then placed in the trough to dry.

3rd. A mode of treating waste tin. The waste tin from the tinning bath has the tallow removed from it, by being heated to a dull red heat. It is then converted into chloride of tin by the action of muriatic acid. "Other salts of tin may also be made by "treating the tin in a similar way with other acids."

4th. "Coating sheets of iron with lead or suitable alloys of "lead, but in the case of tin not alloyed to a greater extent with "tin than fifteen per cent., by employing a flux containing sal "ammoniac or chloride of zinc, without oil or fatty matters, and "further by employing for the same purpose a flux contain" [containing?] "any other suitable metallic salt, as chloride of "tin."

5th. The application of "an after coating of lead or suitable alloys "of lead, but if with tin, to an extent not greater than ten per "cent.," "to iron with or without a first coating of other metal, but "previously coated with zinc, or an alloy of zinc."

[Printed, 4*d*. See Repertory of Arts, vol. 5 (*enlarged series*), p. 37; also *Engineers'* and Architects' Journal, vol. 8, p. 31.]

A.D. 1844, July 31.—N° 10,282.

FONTAINEMOREAU, PIERRE ARMAND le Comte de (*a communication*).—"Certain improvements for coating or covering "metals and alloys of metals."

1st. To scour and clean the articles to be coated. This operation "is effected by a prolonged immersion of the pieces in a concen- "trated solution of the carbonated residuum of cyanuret of "potassium, in which they are well scrubbed and brushed."

2nd. "The process of preparing certain metallic salts." A "salt of copper and prussiate of potash" is obtained, by mixing a solution of sulphate of copper with a solution of prussiate of potash in certain proportions, and whilst warm; the mixture is then stirred "until it becomes a thick red paste." A "salt com- "pounded of copper and cyanuret of potassium" is obtained, by mixing a solution of sulphate of copper with "a concentrated "solution of the carbonated residuum of cyanuret of potassium;" on stirring the solution, it becomes a greenish grey paste.

3rd. The process of preparing the electro-depositing solutions. The first solution consists of a solution "of the salt compounded "of copper and sulphate of potash" [prussiate of potash?] "before described," in a solution of cyanuret of potassium. The second solution consists of either of the metallic salts described in the 2nd improvement, dissolved in a solution of prussiate of potash. The third solution is composed of a solution of sulphate of copper, to which sulphuric acid is added. The fourth solution consists of a mixture of cyanuret of potassium and sulphate of zinc solutions, to which is added a certain proportion "of the double salt of copper before described."

4th. "Immersion in these baths with the application of a "galvanic current." Either the first or second (alkaline) baths described under the head of the 3rd improvement, when used in connection with a galvanic current, gives a "brilliant red" copper. Immersion of the articles to be coated in the third (or acid) bath is necessary, in order to increase the thickness of the coating obtained in the alkaline bath. The fourth bath is used to give a coating of "yellow copper."

In carrying out this invention, articles of cast or wrought iron are slightly tinned or zinced, "before proceeding to obtain either "a red or yellow copper coating."

[Printed, 4*d*.]

A.D. 1844, October 29.—N° 10,366.

PARKES, ALEXANDER.—The title is "Improvements in the "manufacture of certain alloys or combinations of metals, and in "depositing certain metals."

The first five heads of this invention relate to the production of "white or pale-coloured alloys, applicable to various useful "purposes."

The sixth head of the invention relates to "the depositing of "metals by employing a salt or salts of the metal intended to be "deposited (rendered liquid by heat) together or in connection "with electric currents." The iodide, chloride, or phosphate of the metal to be deposited is used, either alone or combined with other salts, as the iodide of potassium or sodium.

[Printed, 4*d*. See Repertory of Arts, vol. 6 (*enlarged series*), p. 32; London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 378; Mechanics' Magazine, vol. 43, p. 58; and Engineers' and Architects' Journal, vol. 8, p. 264.]

A.D. 1845, October 9.—N° 10,859.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improve-"ments in the manufacture of iron into sheets, plates, or other "forms, in coating iron, and in preparing iron for coating and "other purposes."

The first two parts of this invention relate to the manufacture of sheet iron.

3rd. "Coating iron with copper or alloys of copper." The iron article (prepared as set forth under the 4th head) is immersed into the melted metal and withdrawn gently therefrom when it has acquired the temperature of the molten metal. It is essential that the operation should be aided by a flux covering the melted metal, through which the articles are immersed into the fused metal. The flux preferred is chloride of manganese. This process is particularly applicable to coating iron with "copper, or "the alloys of copper, with tin, zinc, antimony, or bismuth."

4th. "Preparing iron for coating with copper, or the alloys of "copper, with tin, zinc, bismuth, or antimony." Before intro-"ducing the iron into the fused metal it is dipped "into a strong "or saturated solution of sal ammoniac or borax."

5th. "Preparing wrought iron for making ridges and angle "caps of roofs."

[Printed, 1s. 7d.]

In a Disclaimer enrolled April 9th, 1858, Mellor Hetherington (the assignee of Messrs. Morewood and Rogers), disclaims the whole of the above Specification, except the second part.

[Printed, 3d.]

A.D. 1845, October 9.—N° 10,860.

PARKES, ALEXANDER.—"Improvements in coating or covering "certain metals with other metals and metallic alloys, and for "ornamenting the surfaces of various metallic articles."

The improvements in embellishing metals consist:—

1st. "In the production of a gold design upon a silver or other "metal surface." The required design is printed in any suitable stopping varnish, and the said printed design is gently rubbed on or in the article to be embellished; the gold design may be given to the said article (when the varnish is dry) "by any known "electro process of gilding." Finally, the stopping-out varnish is removed by suitable solvents.

2nd. A silver design upon a metal surface is effected in a similar manner to the process employed in the 1st improvement.

3rd. A black or bronze design is produced by using (instead of the gold or silver solution) a solution that contains muriate of ammonia, sulphate of copper, and distilled vinegar.

The "improvements in coating, &c. metals are comprised under "the two following heads":—

1st. "In coating iron with the following metals and alloys of "metal, viz^{t}, with zinc, copper, lead, tin, and with copper and "zinc in alloy, copper, nickel, and zinc in alloy, copper, silver, "nickel, and zinc in alloy, copper and tin in alloy, copper, zinc, "and tin in alloy, copper, lead, and zinc in alloy, and antimony "in alloy with tin, zinc, or lead, or either of them."

2nd. "In coating copper and alloys of copper with lead, zinc, "and tin."

"In using any of the above metals or alloys of metals for "coating iron or copper and its alloys," they are employed "in a "fused state," with "a large body of the substances herein-after

" directed to be used for fluxes also in a fused state, and floating " upon the surface of the metals."

The following salts are employed as fluxes:—"The chlorides of " the earths and metals; the fluorides of the earths and metals; " the borates of the earths and metals; the barites of the earths " and metals; the cyanides of the earths and metals; the " phosphates of the earths and metals. Certain proportions of some of these substances are used to each metal or alloy; each metal or alloy having its own proportion and ingredients.

Before using the above salts or compounds of salts as fluxes, they are fused so as to drive off their water of crystallization.

In coating articles by this process, they are cleaned, kept " immersed in a solution of some neutral chloride of an earth " or metal," immersed into the bath of molten metal, and then plunged "into a saturated solution of chloride of lime or chloride " of zinc, or other suitable neutral salt."

[Printed, 4*d*. See Repertory of Arts, vol. 7 (*enlarged series*), p. 358.]

A.D. 1846, January 29.—N° 11,065.

HOWELL, GEORGE.—This invention "relates to the covering or " coating with platinum the surface of articles of copper or copper " alloys, or iron wrought or cast."

A solution for electro-depositing reguline platinum is prepared in the following manner:—A solution of oxalic acid is added to a solution containing precipitated bichloride of platinum and potassium; a certain amount of caustic potash mixed with the solution thus obtained renders it fit for use. "Instead of oxalic " acid other substances, as tartaric, citric, and acetic acids, acid " oxalate of potash, and acid tartrate of potash, may be employed " to make the solution of the salt of platinum." The bichloride of platinum and sodium may be substituted for the bichloride of platinum and potassium, in the above-described solution.

It is observable that this solution is worked by means of a galvanic battery and platinum anode, and not by the supply of a salt of platinum from time to time.

[Printed, 3*d*. See Patent Journal, vol. 1, p. 179.]

A.D. 1846, February 11.—N° 11,083.

SMITH, ANDREW.—The title of this invention is "Improve-" ments in coating or covering metals for the purpose of pre-" venting oxidation."

This invention "relates to that process of coating metals " whereby the articles to be preserved from oxidation are plunged " into a bath of molten zinc, and there receive a coating of that " metal."

The "improvements consist in a new mode of transmitting heat " (from the furnace employed for melting the metal) to the vessel " which contains the zinc."

According to the ordinary method of heating the zinc bath " the flame of the fire is made to play round the sides" of the vessel containing the zinc, and the molten zinc is in absolute contact with the iron vessel in which it is contained. "Besides " the great loss of heat which is thus occasioned, the direct " action of the fire upon the iron pan, or the galvanic action of " the zinc, quickly destroys that vessel, and the zinc contained " therein is frequently injured by being burnt."

To remedy the above-described defects, the vessel containing the zinc is placed within an outer pan, the bottom and sides of which are surrounded by the furnace; into the space between the two vessels a bath of lead, or tin, or of any metal that melts at a lower degree of heat than zinc, is placed, thus preserving the molten zinc at a uniform temperature. The inner surface of the pan that contains the zinc is lined with fire-clay or fire-brick, "to " prevent the action of the zinc upon the pan."

[Printed, 9d. See London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 319; Artizan, vol. 5, p. 158; and Engineers' and Architects' Journal, vol. 10, p. 26.]

A.D. 1846, December 12.—N° 11,448.

PIAGET, LOUIS HYPOLITE, and DU BOIS, PHILIP HENRY.—This invention is entitled "Improvements in producing orna-" mental metal surfaces," and it relates to depositing metals upon metals.

The improvements are as follows:—

A single cell arrangement for electrotyping.

A silvering solution.—Sulphate of soda, carbonate of soda, and

carbonate of silver are mixed, in certain proportions, with water; this solution may be used by immersion. When electric force is used the proportions are different; it is preferred to use a battery composed of carbon, dilute nitric acid, dilute sulphuric acid containing salt, and amalgamated zinc; a platinum wire constitutes the positive pole.

An electro-gilding solution.—An aqueous solution is made of phosphate of soda, sulphate of soda, and chloride of gold.

Gilding by immersion.—The bath contains pyrophosphate of potash and chloride of gold.

"An electrotype model plate" is prepared for gilding or silvering by immersion in essence of turpentine, washing, brushing, immersion in dilute nitric acid, dipping in cold water, brushing with rouge, immersion in human urine, and, finally, in cold water.

[Printed, 10*d*. See Repertory of Arts, vol. 10 (*enlarged series*), p. 83; London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 417; Patent Journal, vol. 2, p. 885; and Engineers' and Architects' Journal, vol. 10, p. 292.]

A.D. 1846, December 7.—N° 11,476.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—1st. "Coating iron with a peculiar alloy of tin and zinc." The operation is performed by immersing the articles into a bath of the molten metal, the surface of the molten metal being covered with sal ammoniac; instead of this alloy, an alloy of lead, zinc, and tin may be used.

2nd. "Coating iron with a product of zinc, which results from "carrying on the process of coating iron with zinc." This product (which is difficult of fusion) is melted "in a wrought-iron vessel or "in a reverberatory furnace;" chloride of manganese is employed as a flux on the surface, and the articles are immersed into a bath of the molten metal. The bath may consist of an alloy composed of the above-mentioned product together with certain proportions of lead and antimony, or ordinary zinc may be alloyed with lead and antimony to form a bath.

3rd. "Subjecting coated sheets of metal to pressure, in order "to equalize the coating thereon." Rollers are employed, "re-"volving in a flux kept heated to a rather lower degree of heat "than the melting point of the coating metal."

4th. "Preparing iron for coating," by causing it "to be acted

"on by the vapour of muriatic acid (or of other matter to "prevent or dissolve oxide) confined above the metal bath."

5th. "A mode of preparing sheet iron into corrugations by "stamping or pressure."

[Printed, 9*d*. See Repertory of Arts, vol. 11 (*enlarged series*), p. 169; London Journal (*Newton's*), vol. 32 (*conjoined series*), p. 18; and Patent Journal, vol. 3, p. 50.]

A.D. 1847, March 23.—N° 11,632.

LYONS, MORRIS, and MILLWARD, WILLIAM.—1st. "Ma- "nufacturing alloys of copper with platina and palladium."

2nd. "Improvements in the solutions employed when depo- "siting metals by means of electric currents." Bi-sulphuret of carbon is added, in certain proportions, to the electro-depositing solution. This addition, properly performed, and made from time to time, causes the deposited metal to be bright, instead of crystalline, as is ordinarily the case; an improved dead deposit may be obtained by the use of a larger proportion of bisulphuret of carbon. The solutions preferred are those formed by the solution of a salt or oxide of the metal to be deposited in a solution of cyanide of potassium or sodium.

3rd. "Producing designs, sunk and in relief, in certain metals, "when using deposition of metals for such purposes."

To operate "on copper or alloys of that metal:"—The surface is electro-silvered, the design drawn thereon with copal varnish, and the silver removed from the unprotected parts by electro-etching in a solution of cyanide of potassium; a relief engraving is finally produced by the immersion of the said surface in an etching liquid composed of nitric acid and nitrate of silver. To produce a sunken design, it is drawn on the copper surface in copal varnish; the other portions of the surface are then electro-coated with silver, and the varnish is washed off with turpentine; the article is then etched in a nitrate of silver solution till the desired depth has been obtained. Gold or iron may be used as the protecting metal instead of silver. A solution of sulphate of silver, nitric acid, or perchloride of iron may be used as the etching liquid instead of a solution of nitrate of silver.

To operate on "iron, steel, Britannia metal, type metal, and "zinc:"—The article is electro-coated with copper (by means of a solution of copper in cyanide of potassium), the design drawn, and

the protective coating removed by electro-etching with a solution of cyanide of potassium; the design is then further raised by immersion of the article in a solution of sulphate or nitrate of copper. A sunk design is produced by using the above-mentioned materials in a similar way to that set forth for operating on copper and its alloys. The same process as that described for copper and its alloys may be used, but the above is preferred.

To operate "on surfaces of gold, silver, or copper or the alloys "of either of these metals:"—The protective coating is of iron, electro-deposited from a solution of muriate or sulphate of iron, and the solvent solution is muriatic or sulphuric acid; the etching is deepened (after the iron has been dissolved off) by means of a cyanide of potassium solution in connection with electric force.

[Printed, 4*d*. See Repertory of Arts, vol. 11 (*enlarged series*), p. 113; also Patent Journal, vol. 3, p. 482.]

A.D. 1847, September 30.—N° 11,878.

DE LA SALZEDE, CHARLES.—"Improvements in brassing and "bronzing the surfaces of steel, iron, zinc, lead, and tin."

This invention relates to electro-depositing brass and bronze.

The electro-brassing bath contains certain proportions of sub-carbonate of potash, chloride of copper, sulphate of zinc, "azotate "of ammonia," and cyanide of potassium: the same bath with different proportions of chloride of tin (instead of sulphate of zinc) and of chloride of copper is used to deposit bronze.

Another electro-brassing bath contains certain proportions of sub-carbonate of potash, chloride of copper, sulphate of zinc, and cyanide of potassium; by substituting certain proportions of chloride of tin for those of sulphate of zinc, this bath becomes an electro-bronzing bath.

[Printed, 5*d*. See Repertory of Arts, vol. 11 (*enlarged series*), p. 293; London Journal (*Newton's*), vol. 32 (*conjoined series*), p. 260; Patent Journal, vol. 4, p. 505; and Engineers' and Architects' Journal, vol. 11, p. 169.]

A.D. 1847, November 4.—N° 11,943.

DU MOTAY, CYPRIEN MARIE TESSIÉ.—"Producing incrus-"ted or damaskene work" by "depositing metals, or alloys of metals, upon various substances."

The invention is treated of under the following heads:—

1*st*. Except in the cases mentioned under the 11th and 12th

heads, the design is first formed on the body of the article to be ornamented by any of the usual means. When the design is produced by etching, those parts not to be acted upon are protected by a suitable varnish (see 4th head for instance); the varnish may either be spread over the whole surface and cut away to form the design, or it may be simply applied by a brush where it is required.

2nd. To inlay with one metal. The metal is deposited to the depth of the hollow parts of the design and "the damaskened sur- "faces are laid bare" by removing the superfluous metal.

3rd. Inlaid work may be produced by successively depositing various thicknesses of various metals upon a given intaglio design; the superfluous metal is then removed, thus forming the pattern.

4th. The raised parts of the design are coated with a "reserve," the intaglio parts are filled up by metallic deposition, and, finally, the "reserve" is cleaned off and the superfluous metal removed. The reserves are, "copal or oil varnish, mixed with minium, "cinnabar, pure baryte, or gamboge;" printing ink; and "as- "phalte or bitumen dissolved in essence of turpentine."

5th. To damaskene in several metals by means of "reserves." The design is produced of the same depth or of the same height throughout; a "reserve" is used to protect all those parts that are not intended to receive the first deposit; when the deposit is made the "reserve" is removed, and those parts are protected that are not intended to be coated with the second metal; the second metal is then deposited, and this sequence of processes is continued until all parts of the design are finished in the desired manner.

6th. If the intaglio or relief of the design is of different depths no "reserves" need be used. The shallowest part of the device is filled up with the first metal, the next shallowest part with the second metal, and so on until the whole of the device is completed.

7th. To produce designs in relief by filling up devices in intaglio. The raised parts are protected and the metal is deposited thick enough to form the required designs.

8th. Inlaid work in one metal is produced by taking a flat piece of electro-coated metal, stamping a design upon it and removing the superfluous metal.

9th. Inlayings in several metals. A flat piece of metal has several

coats of different metals given to it; it is then stamped to a suitable depth in different parts of the pattern, and the whole is ground level.

10th. Double-faced damaskenes are produced by stamping the design upon a thin plate; the plate is then coated with metal; on both sides being levelled, a design in a different metal will appear on each side.

11th. A design in two metals is produced by depositing one metal on all the unprotected parts, cleaning off the reserve, and depositing the other metal on the remaining portions of the design.

12th. Double-faced designs, visible in the same metal on both sides, are produced by depositing two metals on the same foundation plate, as in the 11th head, but detaching them from the foundation plate when finished.

13th. This process consists in applying a plate with the design stamped through it, to a foundation plate, and filling it up suitably with various metals; it is then detached from the foundation plate.

14th. Producing devices upon non-metallic surfaces.

15th. Metallic devices for inlaying in wood by the usual means. A sheet of metal with coatings of various thicknesses, of various metals, is cut in cross section; the shape of the cross section of the metal determines the device.

In the above-described processes the coatings may either be given by electro-deposition or by immersion in an aqueous metallic solution.

[Printed, 5*d*. See Repertory of Arts, vol. 12 (*enlarged series*), pp. 53 & 135; London Journal (*Newton's*), vol. 32 (*conjoined series*), p. 359; and Engineers' and Architects' Journal, vol. 11, p. 217.]

A.D. 1847, November 18.—N° 11,971.

PARKES, ALEXANDER.—1st. "Improvements in the manufac-" ture of lead."

2nd. "Improvements in the manufacture of copper, silver, and " gold."

3rd. "Improvements in the manufacture of iron."

4th. "Improvements in the manufacture of manganese."

5th. "Improvements in coating iron and steel with copper and " its alloys." The inventor states:—"I melt copper or its alloys, " *and I add thereto* common salt (muriate of soda) in sufficient

" quantity to form a fused flux of three or more inches in depth " over the surface. The iron or steel being first cleaned, as is " well understood, is then dried and immersed, as heretofore " practised."

[Printed, *4d.* See Repertory of Arts, vol. 12 (*enlarged series*), p. 191.]

A.D. 1848, April 27.—N° 12,142.

PARKES, ALEXANDER.—The title of this invention is "Im- " provements in the manufacture of metals, and in coating " metals."

The improvements in the manufacture of metals consist " in " separating copper and some other metals from their sulphuretted " ores into the state known by copper smelters as regulus or " coarse metal," " and also in obtaining the metals by one process " or operation of melting from a regulus or other sulphuret of a " metal."

In relation to coating metals, the inventor states :—"My im- " provements in coating metals apply to iron and steel, and con- " sist in the use of an alloy composed of about nine parts lead, " and about three parts antimony, or of about nine parts lead, " about one of tin, and about one of antimony, and I fuse these " alloys in a convenient vessel, and keep them in a melted state " under a flux composed of chloride of barium or of sodium, or " of the two combined, and I prefer to have such flux of con- " siderable depth upon the melted alloy. In order to coat there- " with I first carefully clean the articles, as is well understood, and " immerse them in the melted metals till the desired coating is " obtained."

[Printed, 3*d.* See London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 332; Repertory of Arts, vol. 14 (*enlarged series*), p. 19; Artizan, vol. 7, p. 105; and Patent Journal, vol. 6, p. 87.]

A.D. 1849, March 14.—N° 12,523.

FONTAINEMOREAU, PETER ARMAND le Comte de (*a communication*).—Coating metallic and other bodies with metals by means of aqueous solutions of certain salts.

1st solution. Most applicable to gilding silver. The precipitate caused by adding a saponaceous solution of " Gayac pitch " to chloride of gold is dissolved in a solution containing caustic potash or caustic soda.

2nd solution. Most applicable to gilding bronze. It contains a salt of gold, caustic potash or soda, sulphate of potash or soda, and sugar.

3rd solution. "For platining metals and alloys of metals." Bichloride of platinum and potassium is dissolved in phosphate of potash or soda.

4th solution. Applicable to silvering. This solution contains carbonate of silver, carbonate of ammonium, and carbonate of soda or potash.

5th solution. A coppering solution. Carbonate of copper is dissolved in a solution of bicarbonate of soda or potash.

6th solution. Another coppering solution. Cyanide of copper is dissolved in cyanide of potassium, and an excess of cyanide of potassium added thereto.

7th solution. For brassing. Carbonate of zinc is dissolved in carbonate of ammonium. Either the fifth or sixth solution is mixed with this solution to produce a fit compound for electro-brassing.

8th solution. A tinning bath. Chloride of tin is dissolved in caustic potash or soda, and an excess of caustic potash or soda added thereto.

9th solution. A bath for coating with lead. This is prepared in a similar manner "to the preparation of the tin bath herein-" before described," litharge being used instead of chloride of " tin."

In electro-depositing lead or tin upon zinc or iron, or tin or brass upon lead, an intermediate coat of copper or brass is deposited before depositing the final coating.

All the above-described solutions are used for depositing their respective metals by means of electric force.

10th solution. "For coppering on zinc." A solution containing " borric acid" [boracic acid?] and ammonia is supersaturated with hydrated oxide of copper.

11th solution. For coppering. This solution consists of ammonio-sulphate of copper.

12th solution. "For brass coating." Ammonia is "saturated " with chloride of copper in a state of powder."

13th solution. "For coppering zinc and tin." "A solution of " very concentrated sulphate of copper," to which is added "a " small quantity of sulphuric acid."

The 10th, 11th, 12th, and 13th solutions are used without the assistance of a galvanic battery for coating by immersion only.

[Printed, 4d. See Mechanics' Magazine, vol. 51, p. 284; also Patent Journal, vol. 9, p. 55.]

A.D. 1849, March 19.—N° 12,526.

RUSSELL, THOMAS HENRY, and WOOLRICH, JOHN STEPHEN.—1st. "The application of cadmium and its alloys for "coating the surfaces of iron and certain other metals and alloys "of metals, either for the purpose of affording protection from "decay or as a superior coating."

One method is by means of electro-deposition. A precipitate is obtained by adding carbonate of soda to a solution of cadmium in nitric acid. The depositing solution consists of a solution of the above-mentioned precipitate in cyanide of potassium; an excess of cyanide of potassium is then added. In depositing alloys of cadmium "the cyanide of potassium should not be in any great "excess."

Another method is by "dipping the metals into a melted bath "of the coating metal." It is, in this case, preferred to alloy the cadmium with tin or zinc. "The melted alloy should be covered "with a layer of melted fat, to prevent contact of air. The "cleaned metal to be coated is first dipped into a saturated solu- "tion of chloride of zinc, and then put into the melted metal and "well stirred about until it is coated."

Another method "consists of applying cadmium or its alloys as "a means of preserving iron and other metals, by applying such "metal in contact, by mechanical or other means, in like manner "to what zinc has heretofore been applied."

2nd. Electro-depositing "copper in alloy with other metals." The solution is prepared by dissolving certain proportions of acetate of copper, acetate of zinc, acetate of potash, and benzoate of potash in hot water; enough cyanide of potassium is added to "dissolve the precipitate, which is caused on adding it," and about one-tenth more.

[Printed, 4d. See Repertory of Arts, vol. 15 (*enlarged series*), p. 163 Mechanics' Magazine, vol. 51, p. 285; and Patent Journal, vol. 9, p. 70.]

A.D. 1849, March 26.—N° 12,534.

PARKES, ALEXANDER.—1st. "Coating iron tubes, sheet iron, "and other articles manufactured of iron or other metal, with

" any two or more of the following metals,—copper, silver, tin, " bismuth, and lead,—in successive layers, in order to increase " the protective powers of such metals." For this purpose solutions of the metals are decomposed by electric agency.

2nd. " Improvements in the manufacture of certain metals."

3rd. " Improved modes of treating and working certain metals " and alloys of metals, and their application to various useful " purposes."

" Combining iron, silver, and nickel, and their alloys, with " phosphorus."

" Coating iron, and other metals and alloys, with metals and " alloys combined with phosphorus, such metals and alloys so " combined melting at a lower heat than the metals to be coated." The coating is effected by immersing the cleaned metals " into the " phosphorated compounds when in a melted state."

Another method " is to cast a coating of some of the aforesaid " phosphurretted compounds upon copper rollers or cylinders, " which have been reduced after repeated use, and turning down " and upon some manufactured articles of iron and other metal " and alloy of metal."

" Forming alloys with molybdenum, chromium, tungsten, and " manganese, with copper and copper and its alloys."

Printing rolls of iron, brass, or white metal are electro-coppered. If the rolls are of iron or white alloy, the solution of copper in cyanide of potassium is preferred to be used as the depositing bath.

[Printed, 6*d*. See Repertory of Arts, vol. 14 (*enlarged series*), p. 361; Mechanics' Magazine, vol. 51, p. 309; and Patent Journal, vol. 8, p. 42.]

A.D. 1849, June 7.—N° 12,654.

SMITH, STANHOPE BAYNES.—1st. A solution "for plating " either with or without an electrical current" "consists of a " solution of sulphocyanide of potassium, sodium, ammonia, " barium, calcium, alumium" [aluminum?] " strontium, or mag- " nesium nearly saturated with sulphocyanide of silver or other " salt of silver."

2nd. " Improved methods of bright silvering." For this purpose any of the following substances are added to the silver solution:—" Seliniuret" [selenide?] " of carbon, iodine, iodide, of " nitrogen, gun cotton or xyloidine, sulphur salts, sulphuretted

" oils, creosote, xanthates, bisulpho-carbonate of oxide of methyle,
" acetic, hydrochloric, chloroacetic, hydrocyanic, hydrosulphocy-
" anic, hydrosulphuric, sulphurous, selenious, sulphovinic, tartaric,
" and xanthic acids."

3rd. " Improvements in the manufacture of articles by electrical
" deposition."

" Depositing metal both on the exterior and in the interior of a
" mould of fusible alloy, or any other suitable substance, so as to
" produce two articles of different sizes by the use of one mould,
" and afterwards melting out or otherwise removing the said
" mould from between the said articles."

" The use of gutta-percha for making moulds."

" The use of gutta-percha dissolved in oil of turpentine, or any
" other suitable solvent, as a varnish to stop out portions of a
" conducting surface."

4th. " An improvement in obtaining motive power."

Another improvement consists in the use of gutta percha as an etching ground, either in electric or other etching.

[Printed, *4d.* See Mechanics' Magazine, vol. 51, p. 571; also Patent Journal, vol. 8, p. 224.]

A.D. 1850, March 7.—N° 12,993.

POMEROY, EBENEZER G.—The title of this invention is "A
" new and useful process of coating iron and other metals with
" copper and other metallic substances."

Process No. 1.—The iron is immersed "in dilute sulphuric
" acid for the purpose of cleansing the surface of the article which
" is to be coated," submitted to a brisk heat, and, when dry, immersed "in a mixture of clay and water;" the article is then dried again "over a brisk fire, as before, and it will be in a proper con-
" dition for process No. 2."

Process No. 2.—The iron is dipped into "a suitable bath of
" melted metal, copper or its alloys." " In the first dipping the
" iron should remain in the bath so long as it will bear it without
" becoming hot short, for (observe) the more the copper penetrates
" the iron upon the first dip the greater will be its toughness and
" strength, and if it be desired to increase the thickness of the
" coating you may make dips in quick succession; this will of
" course increase the coating upon the surface."

[Printed, *3d.* See London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 166; Mechanics' Magazine, vol. 53, p. 298; and Patent Journal, vol. 9, p. 285.]

A.D. 1850, March 23.—N° 13,020.

ROSELEUR, ALFRED GUILLAUME.—"Certain improvements "in coating or covering metals with tin."

1st. Coating by immersion.—A boiling solution of ammoniacal alum and "protochloride of tin, or other salts of the same base," is used. This process may be employed "as a means of scouring "and cleaning, for it answers admirably for preparing castings of "iron and other rough articles to receive the coating of tin "obtained by the different processes hereinafter described."

2nd. Coating "by means of immersion and double affinity."—The solution preferred contains certain proportions of bitartrate of potash or soda, and "proto-chloride or other salt of tin." This solution is worked "by means of the simultaneous presence" of zinc, and of the article to be coated.

3rd. Electro-tinning.—The solution consists of certain proportions of pyrophosphate of potash or soda, and proto-chloride of tin dissolved in water. A tin anode is used with this solution.

[Printed, 4*d*. See Mechanics' Magazine, vol. 53, p. 255; also Patent Journal, vol. 9, p. 296.]

A.D. 1850, August 9.—N° 13,216.

STEELE, JOSEPH.—1st. Electro-tinning.—The aqueous solution used contains "common soda," "American" or "Russian" potash, caustic potash, cyanide of potassium, acetate of zinc, and binoxide of tin.

2nd. Electro-brassing.—The solution contains "American" potash, acetate of copper, liquid ammonia, sulphate of zinc, and cyanide of potassium.

Electro-coppering.—The solution is the same as that for electro-brassing, except that the sulphate of zinc is omitted.

Bronzing.—The electro-brassed or electro-coppered articles are made to have a bronze appearance by the application of a mixture containing "sulphureted ammonia," water, red coloring matter, French chalk, and plumbago; this mixture is applied "with a hair pencil or brush in the usual way." Chrome yellow and Prussian blue are the colouring agents in the case of green bronze.

3rd. Electro-gilding.—To make the solution, prussiate of *potash and* carbonate of potash are fused together; the vitrified

mass is then dissolved in water, together with chloride of gold. Copper may be added to this solution if a dark gilding is required. "A small electrode of zinc, or strip of zinc or copper," is used to work this solution.

4th. Electro-silvering.—The solution is made in a similar way to that for electro-gilding, chloride of silver being substituted for chloride of gold. "A small electrode, or strip of zinc," is used to work this solution.

[Printed, *4d.* See Mechanics' Magazine, vol. 54, p. 134; also Patent Journal, vol. 10, p. 220.]

A.D. 1850, December 12.—N° 13,401.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—1st. Coating zinc with lead.—A quantity of lead is poured into the bottom of a flat shallow pan of the size and shape of the sheets it is intended to produce. A sufficient quantity of solid zinc is then laid upon the lead and allowed to fuse (or molten zinc may be poured into the pan), the two metals are allowed to remain in the fluid state some little time (to permit them to separate and to be skimmed), and the pan with its contents is set aside to cool. When the compound slab has cooled to about 300° it may be passed through rollers and extended.

Coating on both sides.—When the above-mentioned slab "has "cooled down to a little above the melting point of lead," sal ammoniac is sprinkled on its surface, and a stick of lead is rubbed on the surface of the hot spelter until sufficient lead is melted to form the thickness required.

2nd. Coating zinc, or alloys of zinc and copper, with copper.—A stick of zinc, or of an alloy of zinc, is rubbed over a hot slab of copper in a similar way to that described above for zinc and lead; a forged plate of copper may be used instead of a slab. To give a copper coating to both sides of the zinc, two plates of copper, prepared as above set forth, are placed vertically in a mould with their zinc faces towards each other; the mould is then heated, and sufficient molten zinc poured into the said mould to fill it up.

3rd. To make "a compound slab of tin or solder upon lead."—A slab of lead, at the bottom of an iron pan, whilst still hot, is rubbed "with a piece of solder or tin," in a similar manner to that described in the 1st and 2nd parts of the invention. Spelter

or zinc is coated with solder or tin in a similar manner, substituting spelter for lead.

4th. Coating sheet iron.—A sheet of zinced or zinced tinned iron is placed upon a hot plate, and has melted lead poured over it; while it is in a fluid state a warm roller is passed "over "its surface to set it to a proper thickness." Lead or zinc sheets coated with tin or solder are used to coat sheet iron with lead or zinc. A heated zinced iron plate has the lead or zinc sheet laid on it (muriatic acid being between), and a heated roller is passed over the whole, then a cold roller.

Lead may be united to zinc by a similar process. Tinned sheet iron or zinc may be coated on both sides by placing it between two sheets of the coating metal, and operating as described above. Tinned lead may be coated with zinc by a process analogous to that of coating iron.

5th. "Employing a reverberatory furnace when coating with "lead or zinc." A layer of powdered charcoal is placed "on the "surface of melted zinc or lead, which is contained in a vessel or "pit made of iron or other suitable material, in a reverberatory "furnace. The flame or heat ignites the charcoal or coke, which "is kept in an incandescent state."

[Printed, *4d.* See Repertory of Arts, vol. 20 (*enlarged series*), p. 175; Mechanics' Magazine, vol. 54, p. 514; and Patent Journal, vol. 11. p. 134.]

A.D. 1851, January 11.—N° 13,442.

GRISSELL, HENRY, and REDWOOD, THEOPHILUS.—"Im-"provements in coating metals with other metals."

1st. "Coating iron with zinc."—The article to be coated is immersed in a bath of the melted metal. The fluxes used on the surface of the melted metal are chloride of zinc, chloride of zinc mixed with chloride of potassium or chloride of sodium, and sulphate of zinc mixed with chloride of potassium or chloride of sodium.

2nd. "Coating zinc, iron coated with zinc, or other metal with "a metallic alloy."—The coating process is performed by means of the melted metal. An alloy containing certain proportions of tin, zinc, and lead has a superstratum of chloride of zinc mixed with sal ammoniac. An alloy of bismuth, lead, and tin is used in the same way as the preceding.

3rd. "Coating iron or other metal with tin or with tin alloyed

" with lead."—The flux used, in this case, consists of a mixture of chloride of zinc and sal ammoniac.

4th. " Coating iron or other metal with silver or with an alloy " of silver and copper."—The iron is amalgamated on its surface and then put into the melted silver or alloy. The amalgamation is accomplished by immersing the iron into a heated mixture containing mercury, zinc, sulphate of iron, muriatic acid, and water; the mercury is then rubbed over the surface of the iron.

5th. Coating iron.—Borosilicate of lead is used as a flux. Iron is coated with copper by exposure to the vapour of the chloride of copper, and the coppered iron is converted into brassed iron by exposure to the vapour of zinc.

[Printed, 4*d*. See Repertory of Arts, vol. 18 (*enlarged series*), p. 119; Mechanics' Magazine, vol. 55, p. 73; and Patent Journal, vol. 11, p. 180.]

A.D. 1851, January 31.—N° 13,486.

STIRLING, JOHN DAVIE MORRIES.—1st. "The use of polished " rolls" to such metallic sheets "as are either intended for being " coated with other metals or after such sheets have been so " coated."

2nd. Zinced iron sheets are coated with tin by immersion in a bath of fused tin. The surface of the fused metal is covered with fatty matters, or with "chloride of tin, so as to keep the surface " of the metal free from oxidation."

3rd. Zinc and its alloys are covered with tin or an alloy of tin by immersion in a bath of the fused metal. The rolled zinc plate is heated previous to the dipping, and the temperature of the fused metal should be as low as possible.

4th. Coating lead or alloys of lead with tin and its alloys.—This process may be conducted, "as above described for the coat- " ing of zinc." The hydraulic press may be employed in this process, the melted metal being poured into a suitable receptacle and expressed through a die of the length and width of the required sheet. Another method consists in placing the lead sheet in an iron mould, and running the melted tin over it from a chamber at one end of the mould, the communication between the chamber and the mould being by means of a sluice valve.

Zinc and its alloys may be coated with tin and its alloys in a similar manner to that just described for lead and its alloys.

5th. " Coating zinc and its alloys with tin and its alloys by

" pressure."—Rolls may be employed to roll a superposed sheet of tin into contact with a sheet of zinc.

6th. The employment of zinc in welding.

[Printed, 4*d*. See Repertory of Arts, vol. 18 (*enlarged series*), p. 317; Mechanics' Magazine, vol. 55, pp. 134 & 374; and Patent Journal, vol. 12, p. 14.]

A.D. 1851, February 12.—N° 13,512.

TUPPER CHARLES WILLIAM, and DE NORMANDY, ALPHONSE RENÉ LE MIRE.—" Improvements in the manufacture " of iron coated with other metal, commonly called galvanized " iron."

[No Specification enrolled.]

A.D. 1851, December 31.—N° 13,889.

GREENSTREET, FRANCIS HASTINGS. (*A communication.*)—The title of this invention is " Improvements in coating and " ornamenting zinc."

" These improvements consist in modes of coating, coloring, " and ornamenting zinc, or bodies having a coating or surface of " zinc, by the application to the surface of acids, and acids com- " bined with other substances which act chemically upon zinc, " either by themselves or when mixed together, or mixed with " pigments or other materials, and the coating or chemical com- " pound thus produced upon the zinc may either serve by itself " for the protection or ornament of the surface, or it may form " the base or priming, over which painting may be executed in " the common manner with colors mixed with oil or varnish; " and provision is made for finishing, preserving, and polishing " the coating formed on the zinc by applying over it suitable " varnishes or polishes."

Amongst the preparations set forth in detail, only the following can, in any way, be presumed to act by the deposition of the metal which forms their basis upon the zinc which is undergoing ornamentation:—

" Preparation B."—Chrome yellow [chromate of lead] mixed with dilute muriatic acid.

" Preparation C."—" Mountain or Saxony green " mixed by degrees with dilute muriatic acid.

" Preparation D."—White lead or "kreumitz white," [kremnitz white?] mixed with dilute muriatic acid.

" Preparation F."—" Butter of antimony " [terchloride of antimony?] mixed with the above-described preparations or with dilute muriatic acid.

" Preparation G."—Butter of antimony diluted with water.

" Preparation H."—Butter of antimony mixed with spirits of turpentine.

The above preparations, and others that are mentioned, are applied to the zinc surface either by "sprinkling," " dabbing," " spreading," or " marbling."

[Printed, 5*d*. See Repertory of Arts, vol. 20 (*enlarged series*), p. 108; also Mechanics' Magazine, vol. 57, p. 36.]

A.D. 1852, February 13.—N° 13,971.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—1st. Slabs or sheets of wrought zinc are coated with lead by heating them on a hot plate and rubbing them with a stick of lead; melted lead is then poured gently on the slab or sheet.

2nd. Thick wrought zinc is covered on both sides with a thick coating of lead or tin or their alloys, " by the employment of a " pan or suitable means to retain the molten metal about coated " zinc, in the process of dipping such zinc into molten metal."

3rd. " The extension of zinc after it has been coated, by im- " mersing or dipping it in molten lead or suitable alloys of that " metal." After dipping, the sheet or plate is rolled hot between rolls " slightly hollowed on the surface."

4th. Stamping wrought iron or zinc gutters.

5th. Fluting corrugated sheet metal by stamping or otherwise.

6th. " The combined use of sal ammonia, or other suitable chlo- " ride and sand, or a similar substance, laid on the surface of " metal when coating one metal with another."

7th. " The use of a lighter metal floating upon a heavier one " when coating one metal with another." In coating iron with lead it is made to pass through a thin layer of molten zinc before it passes through the molten lead. " A division in the upper part " of the bath," dipping below the surface of the molten lead, is used to facilitate the operation.

8th. Coating wire, &c.—The articles are brought out of the molten metal through a tube filled with vapour or gas.

9th. A fan draws off the products of combustion from the bath of molten metal.

10th. "Drawing pipes made of black iron and afterwards coating them."—This part of the invention "is for manufacturing uncoated sheet iron into pipes by seaming the edges of such sheets so as to form pipes, and then cleaning the same, and then dipping them into molten zinc or other suitable molten metal, so as to coat the iron, and at the same time solder up such seams or joints."

[Printed, 7*d*. See Repertory of Arts, vol. 20 (*enlarged series*), p. 216; also Mechanics' Magazine, vol. 57, p. 177.]

A.D. 1852, March 24.—N° 14,040.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improvements in shaping, coating, and applying sheet metal to building purposes."

1st. "Preparing sheets of iron or other suitable metal in such a manner that the plate or sheet shall be alternately thick and thin." Sheets of metal thus prepared are employed for corrugating.

2nd. "Stamping or otherwise corrugating sheets of metal or coated metal in an oblique direction."

3rd. "The obtaining of a thick coating of lead or tin, or their alloys, upon zinc or suitable alloys of that metal, by the employment of a pan or other suitable means to retain the molten metal about the zinc in the process of dipping such zinc into molten metal."

[Printed, 6*d*. See Repertory of Arts, vol. 20 (*enlarged series*), p. 292; also Mechanics' Magazine, vol. 57, p. 278.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 1.—N° 39.

ABATE, FELIX, and DE CLERVILLE, JOHN JULIUS CLÉRO —"Improvements in preparing, ornamenting, and printing on surfaces of metal and other substances."

"Dyeing and printing on surfaces of metal, wood, glass, and "other substances."

"Ornaments in a metal different from that of the ground" are produced "*by laying the article in the electro-plating bath*" *after having printed a* "*resist*" *upon it*; the said resist consists of "a "fatty or resinous ink."

Sometimes the surfaces are prepared "by silvering or tinning "them, in order to increase the transparency and brilliancy of the "subsequent colouring."

Another part of this invention "consists in scouring metallic "surfaces by coating them with a solution of glue and chloride of "tin, and when dry taking off such coating, and burnishing the "surface when a dead colour is not wanted."

The last portion of this invention consists in "the ornamenting "of metallic sheets by drawing them between toothed bars."

Other details and processes are set forth at length in this Specification.

[Printed, 3½*d*.]

A.D. 1852, October 1.—N° 49.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improve-"ments in coating metals."

1st. "Improvements in coating zinc with lead, by placing a thin "sheet of lead upon a plate of sheet zinc, and, after heating them, "to roll them so as to unite them."

2nd. "Immersing sheets or other articles to be coated (which "have been previously cleaned by acid) in hot sand, in which "there has been previously mixed a little sal-ammoniac; thereby "to a certain extent preventing the oxidation of the iron in "exposing it to hot air in the customary manner."

3rd. "The employment of three rollers within the bath of mol-"ten metal, when coating sheets of iron or other metal." The Specification describes and the Drawings show three rollers mounted in a frame and geared together; the frame and rollers are placed over, and partly in the bath of molten metal. Motion being communicated to the middle roller, the sheets are introduced between the first and second rollers, they are then (by means of a hook in the workman's hand, and a fixed partition in the bath) guided between the second and third rollers; the rollers being

geared together in a horizontal plane, revolve in alternate directions, and thus enable the plate to be drawn downwards when it is placed between the first and second rollers, and drawn upwards when it comes between the second and third rollers.

Two rollers can be made to answer the purpose.

[Printed, 5½*d.*]

A.D. 1852, October 7.—N° 291.

LYONS, MORRIS.—(*Provisional Protection only.*) The title of this invention is "Certain improvements in coating the surfaces of "iron."

The inventor states :—"I first cleanse the iron by means of "vitriolic acid or any other suitable agent, *and then coat it with a "thin film of copper or zinc ;* I afterwards coat it with some adhe- "sive solution, such, for instance, as sugar & water or Venice "turpentine dissolved in benzole or naptha ; I then sift on to the "surface an enamel powder composed of—Pulverized flint glass in "the manufacture of which oxide of zinc has been used instead of "lead, 150 parts. Borate of lime, 25 parts. Carbonate of potasse "or sulphate of soda, 25 parts. These proportions may be "varied according to circumstances, and in some cases I "use the bi-carbonate of potasse, and the bi-sulphate of soda, "instead of the carbonates & sulphates. The whole is then "fused in an ordinary enamelling oven. This forms a base to "receive any desired number of coatings, & patterns or devices "may be subsequently introduced according to taste."

[Printed, 2½*d.*]

A.D. 1852, October 9.—N° 323.

ROUSSEAU, JEAN JEMOT.—(*Provisional Protection only.*) The title of this invention is "Improvements in inlaying and orna- "menting metal plates to be used for door plates, sign plates, "and other purposes to which such inlaid or ornamented plates "may be applicable."

The first part of the invention relates to the production of "ornamented plates by means of the electrotype process."

The inventor further states :—"I also propose to produce "ornamental letters of any elaborate pattern or device by prepar- "*ing* suitable moulds or dies, and casting or otherwise forming the "*letters therein.* The die or mould for each letter is to be made

" square, and the letters may be either sunk or in relief. Of " course when moulds or dies are once made any number of let- " ters may be produced, so that highly ornamented letters may be " used to form a name, the letters being arranged side by side in " a line, so as to form a plate, *on which some other metal may be* " *deposited*, so as to produce the appearance of highly ornamented " letters, either imbedded in the deposited metal or surrounded by " the metal from the moulds.

" I also propose to fill up *by metallic deposition* letters or " designs engraved in plates in the ordinary manner, in place of " the black or red wax or other composition usually employed for " that purpose."

[Printed, 9*d.*]

A.D. 1852, November 30.—N° 912.

JEFFS, WILLIAM.—The title of this invention is "Improve- " ments in manufacturing letters, figures, and ornamental work, " and in the mode of attaching the same to wood, stone, iron, " and certain other materials."

1st. "The cast iron or other metal letters or figures are *coated* " *with sheet brass* or other metal by soldering or cementing in the " same way as is now customary in coating or plating articles of " saddlery or by electro-plating."

2nd. "Improved modes of manufacturing letters, figures, or " ornaments, so as to facilitate the fixing of them to doors, " signboards, and other articles."

3rd. "The application of gutta percha and papier maché to the " manufacture of letters and figures for shop fronts and other " similar purposes."

[Printed, 5*d.*]

A.D. 1852, December 11.—N° 1032.

MORRIS, TIMOTHY, and JOHNSON, WILLIAM.—"Improve- " ments in depositing alloys of metals."

The electro-depositing solution which is used consists of certain proportions of cyanide of potassium and carbonate of ammonium.

Either certain salts of the metals to be deposited may be dissolved in water together with the above-mentioned materials, or the solution of cyanide of potassium and carbonate of ammonium may be charged with metal by means of electric force.

It is preferred to use the solution hot, and it is necessary that hydrogen gas be freely evolved from the cathode during deposition.

In electro-depositing brass, the deposition of too much copper is corrected by the addition of carbonate of ammonium to the solution, and the deposition of too much zinc is corrected by the addition of cyanide of potassium.

The use of the solution in the case of brass and German silver is described at length.

[Printed, 3½*d.*]

A.D. 1852, December 28.—N° 1183.

JUNOT, CLAUDE JOSEPH EDMÉE. (*A communication.*)—"Improvements in the mode of reducing several metallic substances hitherto unused, and applying them so prepared to the plating of other metals and substances by means of electricity."

"This invention consists of preparing silicium, titanium, tungsten, chromium, and molybdenum, by causing them to be dissolved, and then, by means of electric currents, to be deposited on to metals and substances."

"Tungstic, silicic, and molybdic acids are obtained as is well understood, and either of them is dissolved in a boiling solution of carbonate of soda. Chronium" [chromium?] "is obtained by double chloride of soda and ammonia. Titanium is obtained in solution by sulphuric acid, which, being evaporated, sulphate of soda and ammonia, with distilled water, is employed. The article to be coated is to be immersed in either of these solutions, and connected to the zinc terminal of a battery, and the other terminal of the battery is connected to a plate of platinum, which is also to be immersed in the solution."

"In order to keep up the strength of the solution" "a small bag full of the metallic salt" is immersed therein.

"These metals may be deposited alloyed together, or with silver or nickel, or other metal."

[Printed, 3½*d.*]

A.D. 1852, December 29.—N° 1196.

POWER, JAMES.—"Silvering all sorts of metals and glass."

The electro-silvering solution for coating metals consists of a

solution, in water, of the following ingredients :—Nitrate of silver, " nitrate of liquid ammonia (hartshorn)" [liquid ammonia?], " nitrate of silver of alcohol (spirits of wine gunpowder proof)" [alcohol?], and a solution of gum galbanum in spirits of wine; more liquid ammonia and alcohol are afterwards added.

" Objects of every shape, whether of concave, convex, or flat " surface, can be perfectly silvered; and when greater solidity is " required a coating of copper can be added also by electricity " without producing any alteration in the whiteness or brilliancy " of the looking glass, mirror, or reflector."

[Printed, 4½*d.*]

A.D. 1852, December 30.—N° 1205.

NEWTON, WILLIAM EDWARD. (*A communication.*)—(*Provisional Protection only.*) " The object of this invention is to cover " articles composed of copper or other base metals containing " copper or other metals with silver or gold, in a more econo- " mical manner than heretofore. For this purpose, the articles " are first well cleansed to remove all dirt and oxidation from " their surface, and they are then submitted, for from two to three " hours or more, to a bath composed of sulphite of soda and " nitrate of silver. The articles are then removed from the bath, " and rinced in cold water and dried, and they are then ready for " receiving the attachment of gold or silver, as the case may be. " They are now heated to a temperature sufficient to scorch white " rag, and are then coated with leaf silver, which can afterwards " be coated with gold, or coated with gold at once. The leaf " metal is laid on by hand, and pressed down with a light dabber; " those parts of the articles most exposed to wear being furnished " with a greater thickness of the precious metals than the other " parts, to increase the durability of the articles. When the leaf " metal is thus laid on, it is subjected to the action of a wire brush, " which will cause it to penetrate the pores of the metal, now " dilated by the action of the heat; and the adhesion of the two " metals being now effected, the surface of the articles may be " burnished and polished in the usual way to fit them for the " market."

[Printed, 2½*d.*]

1853.

A.D. 1853, February 16.—N° 401.

CUTLER, JOB.—"Improvements in the manufacture of spoons "and forks, and other similar articles for domestic use."

The cast iron articles are, if necessary, stamped, they are then pickled, washed, and annealed; then again cleaned, washed, and dried; and the final preparatory processes are those of planishing, filing, smoothing, and (if spoons) bowling—if forks, setting.

The coating or covering with metal "may be done in several "ways, either by dipping them into melted metal, where it is "wished to coat them with a metal which will adhere to iron by "such process, as tin or zinc, or other metal, or by precipitation "by the aid of a battery or electric machine."

To tin the above-mentioned articles, it is preferred to immerse them in a solution of sal ammoniac, to let them become dry, and then to immerse them in melted tin.

To silver the above-mentioned articles they may be plated or electro-plated by any known process.

The wrought-iron articles, after being rolled, cut, and annealed, are pickled, scoured, cleansed, washed, dried, and stamped. If they are to be tinned or zinced they are immersed in the molten metal, and if to be silvered they are electro-plated.

Another part of this invention relates to preparing brass or German silver spoons, &c., to be electro-plated in a similar manner to that above described.

Another part of this invention relates to enamelling or glazing the above-mentioned articles.

The last portion of this invention relates to "the bending or "setting of spoons, forks, butter knives, ladles, and other similar "articles for domestic utility."

[Printed, 6½*d.*]

A.D. 1853, February 17.—N° 421.

WATT, CHARLES, and BURGESS, HUGH.—"Improvements in "coating iron with copper and brass."

"This invention consists of causing sheets, bars, and other "forms of iron to be first cleaned, then coated over with a solution

" of cadmium or zinc, then dried and dipped into a bath of melted " copper or brass, then raised out of the bath into an atmosphere " of steam and carbonic acid flowing in in jets; and when the " form of the iron will admit of it, a pair of rollers is the best " mode of raising out of the bath, and of equalizing the surfaces, " and the reheated sheets or bars may be further rolled, and by " like means two surfaces of iron may be coated and joined."

In practice the following particulars are adhered to:—The surface of the molten metal is covered with charcoal. Carburetted hydrogen may be used instead of steam and carbonic acid. An alloy of tin and zinc is cast on to the points of coated iron bolts by means of casting boxes placed in a certain manner.

Another part of the invention "consists in casting copper or " brass round iron bar or bolt sheet, and rolling the combined " metals when at the requisite temperature." The iron is dipped into the molten metal, and then placed in a loam mould, "which is " at the same time filled with molten metal."

[Printed, 3½*d.*]

A.D. 1853, March 29.—N° 756.

SHAW, GEORGE.—" Improvements in the manufacture of knives " and forks."

The first part of this invention "relates to a new mode of con- " necting the tangs of the blades of knives, and the tangs of " forks, to the handles thereof, for the purpose of preventing such " handles from becoming loose upon being immersed in boiling " water, or from other causes, and for rendering such articles " more durable than when manufactured by the modes hitherto " practised, of manufacturing knives and forks in which the " bolsters thereof are made of distinct and separate pieces of metal " from the blades or tangs thereof." This part of the invention consists of "the tinning of the tang of the blade of a knife, and " the tang of a fork, and then casting around such tinned part a " metal bolster, for the purpose of causing such bolster to be " firmly united to the said tang." The handle is connected to the bolster by soldering.

The second part of this invention "relates to the casting of " hollow metal handles for knives and forks in one entire piece " of metal."

[Printed, 5½*d.*]

A.D. 1853, May 9.—N° 1138.

JOHNSON, JOHN HENRY. (*A communication.*)—(*Provisional Protection only.*) "Improvements in coating or plating vessels and "other articles for the better resistance of the action of acids "and salts."

"This invention relates to the manufacture of chemical or other "vessels and other articles, which for the purpose of resisting "the action of acids and salts have hitherto been made wholly of "platina, which has rendered them very expensive. By this "invention such vessels and articles may be made of any "ordinary, cheap, and suitable metal, which is plated merely with "platina in very thin plates; the metal to be plated is laid in "layers, with the platina upon it; several of them are laid one on "the other, with a piece of iron between each sheet to be plated, "both sides of the iron plates being rubbed with garlic, to "prevent fusion. The pile so formed, consisting of a sheet of "copper (if that metal is to be plated), then a sheet of platina, "and then a sheet of iron, rubbed on both sides with garlic as "described, is put into a furnace, and is afterwards pressed or "subjected to the action of a hammer. The pile is then separated, "and the plates are ready to be rolled out and manufactured into "the vessels required. By the application of rolling mills or "very powerful presses the application of heat may in some cases "be dispensed with."

[Printed, 2½*d.*]

A.D. 1853, July 29.—N° 1777.

NEWTON, WILLIAM EDWARD. (*A communication.*)—"Im- "provements in depositing metals or alloys of metals."

Electro-brassing.—The solutions used consist of the double salts of zinc and an alkaline base, mixed with the analogous salts of copper and an alkaline base. The other solutions mentioned are, acid citrate of zinc (with a similar salt of copper); "solution "of tartrate of zinc in potash or soda" (also with a similar salt of copper); solution of a salt of copper in cyanide of potassium, added to a solution of a salt of zinc in ammonia; and, solution of a salt of zinc in cyanide of potassium, added to an ammoniacal solution of copper.

"Depositing copper alone upon wrought or cast iron, either by

" immersion or by the battery."—A solution is used that contains certain proportions of acetate of copper, " hydrochlorate of " ammonia," and hydrochloric acid. Another solution contains citrate of copper and citric acid.

Electro-bronzing.—One solution consists of a mixture of the double tartrate of copper and potash, with the double tartrate of tin and potash, either with or without an excess of potash. Another solution contains the double cyanide of copper and potassium, zincate of potash, and stannate of potash. A third solution contains the double tartrate of copper and potash, the double tartrate of zinc and potash, " and the double tartrate of " the protoxide of tin." A fourth solution consists of a solution of a salt of copper in cyanide of potassium, and a solution of protochloride of tin in potash.

Electro-depositing an alloy of zinc and manganese.—" Mix in " suitable proportions solutions of chloride of sodium, sulphate " of zinc, and chloride of manganese, or the chloride of man- " ganese may be replaced by sulphate of manganese; the chloride " of sodium by sulphate of ammonia, hydrochlorate of ammonia, " or chloride of potassium; and the sulphate of zinc by chloride " of zinc."

Another part of this invention consists " in obtaining great " thickness of coating by depositing successive layers of metals " or alloys, or alternate layers of metals and alloys."

Various applications of these improvements are set forth at length.

[Printed, 3½*d.*]

A.D. 1853, August 5.—N° 1836.

NEWTON, WILLIAM. (*A communication.*)—The title of this invention is " Improvements in the process of coating cast iron with " other metals, and the alloys of other metals," and it relates to coating cast iron with copper or with brass, by galvanic action.

Zinc solution.—" Prussiate of potash " is added to sulphate of zinc, and the resulting precipitate is dissolved in cyanide of potassium.

Copper solution.—Precipitated carbonate of copper is dissolved in cyanide of potassium.

Brass solution.—This is made by mixing together the zinc and copper solutions above described.

To electro-copper cast iron, it is preferred to electro-zinc it first by means of the above-described zinc solution, then to electro-coat it with copper by means of the copper solution.

To electro-brass cast iron it is electro-zinced, electro-coppered, and then electro-brassed.

The electro-brassed iron may be coated with gold or silver, if required.

[Printed, 3½*d.*]

A.D. 1853, September 27.—N° 2215.

CALLAN, NICHOLAS.—(*Provisional Protection only.*) This invention is entitled "A new mode of protecting iron of every "kind against the action of the weather, of rain, river, spring, "and sea water so that iron thus protected may be used for "roofing for cisterns, pipes, gutters, window frames, telegraphic wires, for marine, and various other purposes."

"Iron of any kind or form which may be required is coated "with an alloy of lead and tin by first tinning it in the usual "way, and then immersing it (in the same manner in which iron "plates are immersed in tinning them) into melted lead covered "with some fatty or oily substance to prevent oxidation, or into "a melted alloy of lead and tin, until the tin on the surface of "the iron combines with the lead or alloy. I recommend that "such alloy contain as much lead as tin, and not more than five "or six times as much lead as tin. When a thick coating is "required, the iron is immersed several times into the alloy."

"Even concentrated nitric acid will act far less on such a "coating than on lead."

[Printed, 2½*d.*]

A.D. 1853, October 12.—N° 2340.

CALLAN, NICHOLAS.—Coating iron with alloys of lead.

"Iron of any kind is first coated (in the way in which it is "usually tinned) with tin or with an alloy of lead and tin, which "alloy contains a moderate quantity of lead. When coated with "tin alone, or when the quantity of lead in the first coating is "not sufficient for the purpose for which the iron is intended, the "coated iron is dipped into melted lead, or into an alloy of lead "and tin, which alloy contains a considerable quantity of lead "compared with that of tin, or into melted antimony, or into an

" alloy of lead, tin, and antimony, or of tin and antimony, or of " lead, tin, and zinc, or into an alloy of these four metals. The " melted metal or alloy is covered with some fatty substance or " other material to prevent oxidation."

" When the iron is coated with an alloy of lead and tin, in " which alloy the quantity of lead is five or six times as great as " that of tin, it will resist the action of concentrated nitric, sul- " phuric, or muriatic acid."

" The hardness of the coating is increased by adding a little zinc " to the alloy of tin and lead, but its power of resisting the action " of acids is diminished. The addition of a little antimony to the " alloy of lead and tin increases the hardness of the coating and " improves its power to resist corrosive action. The power of an " alloy of lead and tin to resist the action of corroding substances " is increased by increasing within certain limits the proportion of " lead in the alloy."

[Printed, 2½*d.*]

A.D. 1853, November 7.—N° 2579.

PERSHOUSE, HENRY, and MORRIS, TIMOTHY.—" An im- " provement or improvements in the deposition of metals and " metallic alloys."

This invention " relates to the deposition of metals and me- " tallic alloys by electricity."

In depositing metals or metallic alloys according to this invention, the surface on which deposition is to take place is separated from the metal or alloy to be dissolved by a porous partition. The solution from which metal or alloy is being deposited is kept saturated " by placing therein excess of any suitable salt or com- " pound of the metal or alloy being deposited."

It is preferred to use zinc as the dissolving plate and dilute sulphuric acid in contact with it.

" By this arrangement the deposition of the metal or alloy will " be effected by an electrical current of less intensity than is re- " quired by the ordinary arrangement."

[Printed, 3½*d.*]

A.D. 1853, November 30.—N° 2784.

DAVIS, EDWARD KEATING.—" Improvements in machinery for " making pipes, sheets, still worms, and other articles from that

" class of metals called soft metals, as lead, tin, zinc, bismuth, or " alloys of soft metals that are capable of being forced out of metal " receivers or chambers, through dies, cores, &c."

1st. A double-action hydraulic press. By means of two rams, aving a piston in the centre and emerging from two opposite open ends of the cylinder, two sets of metal containers are acted upon alternately.

2nd. " An arrangement of machinery whereby lead or other " soft metal pipes may be made with a complete interior casing of " pure block tin or other metals or alloys at one and the same ope- " ration." The above-described double-action press is used for this purpose ; the melting pot containing the melted tin is " placed " at a considerable altitude over the pipe making machine, the " melted metal is conducted down a pipe through a heated flue, " and connected to the common standing core that determines the " bore of the pipe in the first instance." To this core a second core or mandril is added, " the same being of considerable length, " and as much smaller in the diameter than the pipe made as the " intended thickness of the casing required. When in operation " the fluid casing metal fills up the vacant or empty space between " the extra long core or mandril and the pipe, when it is after- " wards chilled or solidified by being cooled with water."

3rd. A similar arrangement to that described in the 2nd improvement, except that " the casing metal melting pot is placed in " juxtaposition with the other parts of the machinery, the pot " being made air-tight, and the necessary pressure being obtained " by compressed air acting on the surface of the fluid metal."

4th. " An arrangement of machinery for making soft metal pipes, " and which consists of a strong head stock or die and core holder, " and which is attached to an air-tight metal melting pot similar " to the third arrangement, the necessary pressure or power being " obtained by compressed air acting on the surface of the fluid " metal in the melting pot."

5th. An arrangement for making soft metal sheets, identical in principle to the 4th arrangement.

6th. An apparatus for plating the sheets with other metals at one and the same operation. The arrangement is the same as that of the 5th improvement, with the addition of an apparatus similar in principle to that of the 2nd improvement.

7th. " An arrangement of machinery for making lead or other

" soft metal sheets from the solid metal by hydraulic pressure." The process is very similar to that for making pipes from the solid metal.

8th. A similar arrangement to that of the 7th improvement, "to " which is added the apparatus for tining or plating the sheets " with other metals at one and the same operation as in the sixth " arrangement."

9th. A machine "for the purpose of making sheets of lead or " other soft metals, the metal being worked in a fluid or semifluid " state."

10th. "An improved ram or piston for forcing the metal out of " the metal container when worked in a fluid or semifluid state."

11th. "An improved metal container charging aperture."

12th. "A new double die to be used when coating pipes ex- " ternally with tin or other metals, and consists of fixing two dies " at such a distance from each other so as to admit of a small " chamber or metal container between them, the object of which " is to hold the tin or other metal for the purpose of coating the " pipes. This chamber has apertures round its periphery for " supplying the tin or other metal when in operation. The first " die forms or determines the outside of the pipe; the pipe then " passes through the small chamber, where it becomes coated, and " then passes through the second die, where it is finished; by " this arrangement pure block tin can be used for that purpose.

13th. "A new mode of making the metal containers and the " press cylinders, and consists of casing the interior with wrought " iron."

14th. "A new mode of making still worms when block tin is " required by the pipe-making machinery in the second arrange- " ment."

15th. "Coating lead or other soft metal pipes in the interior or " exterior, or both, with gutta percha or caoutchouc, either in the " combined or simple state, and also combined with other mate- " rials in gums, lacs, bituminous and resinous matters; the same " to be used in a state of solution."

[Printed, 1*s.* 0½*d.*]

1854.

A.D. 1854, January 11.—N° 62.

MASSON, AMBROISE AUGUSTE.—"Improvements in the manu-
" facture of thread or wire, to be used for making gold or silver
" lace."

To make gold lace.—The silver or other wire "having been
" flatted and rolled in the ordinary way," "is to be wound round
" amber or gold colored silk, taking care to avoid any breaks of
" continuity in the metal. The thread is then passed by me-
" chanical means through vessels containing auriferous solutions,
" which are deposited by means of a galvanic or voltaic battery;
" it is then washed, dried, and wound round bobbins. The au-
" riferous solutions may be in a hot or cold state, and the thread
" may be steeped or simply immersed. In order to render the
" silk impermeable, and consequently prevent the absorption of a
" part of the auriferous matter, it should be steeped, before being
" covered by the metal, in stearate of alumina dissolved in dis-
" tilled water, or in oleic acid much diluted. By tightly binding
" the metal on the silk, the gold is precipitated only on the metal,
" the upper part of which alone receives the deposit." The above-
mentioned mechanical means is shown in a Drawing.

To make silver lace.—The same process is used as for gold lace, substituting copper wire for silver wire, and silver for gold.

[Printed, 7*d*.]

A.D. 1854, January 30.—N° 222.

PHILLIPS, WILLIAM.—(*Provisional Protection only*.) The title of this invention is, "Improvements in the manufacture of coffins."

The inventor states:—

"My improvements consist in manufacturing coffins of iron,
" and galvanising, tinning, brassing, or bronzing them by any
" ordinary process."

"In making cast-iron coffins I propose also, if required, to cast
" on the lid the name, age, &c. of the person."

[Printed, 3*d*.]

A.D. 1854, February 1.—N° 246.

CHENOT, CLAUDE BERNARD ADRIEN.—"Improvements in
" accumulating, conducting, and treating gases of combustion,
" and also in generating and applying the same to metallurgic
" and other purposes."

"This invention relates to" "the normalization and enrichment " of gases, and also to their generation and use for metallurgic " and other industrial or manufacturing and also domestic pur- " poses, such as heating, lighting, smelting, refining, welding, " moulding, or casting, *tinning*, and *galvanizing*."

By the alternate application of an oxidizing current of gas, and of a reducing current, to a bath of melted metal, the metal is precipitated on the bottom of the bath. "As the said refining and " reducing actions go on very quietly, and as the metal is pre- " cipitated in perfect order, the same as metal which is reduced " in a solution by an electric current, this treatment yields at " once solid metal, moulded upon the sole of the apparatus in " which the operation has been carried on."

" Owing to the powerful action of the gases, pieces of iron, cop- " per, &c., may be tinned or galvanized in the open air, and by " proceeding with small surfaces in succession, large pieces may " thus be coated; thus a ship or vessel, after being sheathed, " might have its rivet heads covered with the coating, which can- " not be done in the present mode."

Whilst the metal is being refined, "it assumes new properties " which are propitious to precipitation; thus, on one hand, its " density increases; on the other, metals of the iron class get less " fusible; metals of the lead kind, on the contrary, become more " fusible, especially tin; or else the metal volatilizes, and then pre- " cipitation is replaced by sublimation, as in zinc, arsenic, &c."

[Printed, 1*s*.]

A.D. 1854, February 28.—N° 478.

DENNY, THEOBALD.—"Improvements in engraving."

The design is etched upon an oxidised polished steel plate that has been covered with caoutchouc, by means of suitable etching needles, "which remove the coating on the plate, and leave unco- " vered the oxide of the metal without incising the plate."

" A solution of virgin wax and petroleum is passed over the " plate, and immediately cleaned off with dry cotton wadding, so " as to leave the etched parts damp. The oxidized metal exposed " remains unchanged, but the caoutchouc coating assumes a " glossy appearance and increases in size, thus forming a relief."

The plate is now plunged "for about two seconds" into a bath containing certain proportions of cyanide of potassium, distilled *water, tannin, and* sulphate of copper.

The plate is then electro-coated with copper (excepting those parts that are covered with the waxed caoutchouc) by the cyanide solution above mentioned. The caoutchouc coating is then removed, and the whole plate electro-silvered by means of a solution composed of cyanide of potassium, distilled water, ferrocyanide of potassium, tannin, and oxide of silver; on the coppered parts the silver is deposited "evenly," "but only as a metallic powder on "the steel." The metallic powder is then removed, the plate cleaned with colophony and melted wax, and the design electro-etched. The silver and copper coatings are then removed, and the polish of the plate taken away by means of electro-etching, "so as to "allow the printing ink to lay well."

[Printed, 4*d*.]

A.D. 1854, March 20.—N° 661.

PERKINS, JOSEPH.—This invention is entitled "Improvements "in metallurgy, especially applicable to the production of type "and ornamental forms."

A gutta percha mould is made from the original surface (type or other object); it is made conductible by means of plumbago, and is electro-coated with the metal required. Before this coat has arrived at a sufficient thickness to detach safely, the back of the mould is filled up with some metallic alloy and the cast detached from the mould.

To prepare "the raw surface of the back of the electrotype "cast" for union with the filling-up metal, a saturated solution of zinc in hydrochloric acid is used.

In the Provisional Specification the inventor states:—"I can "apply this process to produce a silver-faced type or stereotype, "or I can make silver-faced type by simply depositing silver on "the type by the ordinary means."

[Printed, 3*d*.]

A.D. 1854, April 13.—N° 868.

DEVINCENZI, GUISEPPE.—The title of this invention is "A "method or methods of producing engraved, figured, and typo-"graphic surfaces for printing and embossing from, and for "ornaments also certain machinery employed therein."

The 1st, 2nd, 3rd, 4th, 5th, 6th, and 7th heads of this invention set forth various means of transferring designs to metallic surfaces, and of etching those designs into the said metallic surfaces.

The 8th head relates to a process in which "electro-plating" the metallic surface with another metal is used to obtain the desired result. An impression or transfer is produced on the electro-coated plate and the "super-imposed layer" of metal is then removed by electro-etching "wherever there is no impres-" sion;" the plate is then further etched. By another process the impressed metal is electro-coated, the impressions cleaned off, and the plate electro-etched.

9th. Inlaid work.

10th. Name plates, &c., are produced by electro-depositing metal within the sunken parts of a design.

11th and 12th. These heads relate to etching.

13th. This head relates to "electro-plate reproductions or " stereotype plates."

14th. This head relates to "printing machines."

15th. Cylindrical printing surfaces.

16th. Producing fac-similes, or reversed engravings.

17th. Various applications of the methods specified.

[Printed, 1*s.* 6*d.*]

A.D. 1854, April 27.—N° 951.

PERSON, CHARLES CLÉOPHAS.—(*Provisional protection only.*) "Certain improvements in coating with zinc by galvanization."

"This process, which may be termed 'voltaic zincage by the help " 'of alumina,' is founded upon the intercession or use of alumina " in the electrolytic bath; *i.e.*, the alumina acts as a medium and " facilitates the reduction of the zinc to a great extent. Thus, a " single pair is sufficient even with the sulphate of zinc, and the " reduction is quite regular; *i.e.*, the metallic layer thickens in " proportion to the time spent."

The electro-zincing solution consists of certain proportions of water, alum, and oxide of zinc. "The oxyd of zinc need not be " hydrated. The solution is prepared hot, and no precipitate will " be formed if the temperature does not sink below 60° Fahren-" heit." A positive plate of zinc is used in the depositing trough.

"The zinc then appears immediately with a blueish grey colour, " and although dull, may be easily rubbed into metallic brightness. " Strictly speaking, the oxyd of zinc is soluble in alum, but the " oxyd quickens the process. The reduction takes place on all

" metals now in use, viz., iron, copper, platina, &c.; and the " adhesion is complete if care has been taken previously to make " the surface of the article bright."

[Printed, 3*d*.]

A.D. 1854, May 5.—N° 1006.

HASELER, EDWIN.—" An improvement or improvements in " ornamenting metals, papier mâché, horn, and shell."

The improvements in ornamenting metals are as follows:—

A " negative design " is printed on the metallic surface in a non-conducting printing ink; the plate is then electro-gilt, or coated with any other metal by means of electricity, the printed design acting as a stop; " the design or stop is removed by a " suitable solvent."

Other methods of ornamenting metals are set forth, but none of them involve processes for coating metals with metals.

[Printed, 4*d*.]

A.D. 1854, May 5.—N° 1010.

WARNER, ARTHUR.—" The invention consists of coating sheets " of zinc (previously coated with tin or lead) with sheets of copper " or its alloys."

" The sheets of copper are each to be flushed with solder on one " side. A sheet of coated zinc is to be placed on the solder on " the sheet of copper, and the two sheets are to be placed on an " iron table, the sheet of copper being downwards; and on to the " sheet of zinc a plate of iron is to be pressed, by a screw or " screws, or otherwise, the two surfaces which are brought in " contact with each other having been first moistened with the " ordinary solution used when soldering. Under the table is a " hollow box to receive an iron heater, somewhat larger than the " sheets of metal placed on the table; this heater is to be " heated in a suitable fire or oven, or otherwise, to such a degree " of heat as will cause the solder on the surface of the copper to " melt by the heat of the heater passing through the table and " through the sheet of copper; and when the solder is found to " run, the pressure on the surface of the sheet of coated zinc is to " be increased, so as to ensure perfect contact of all the parts; " the heater is then to be moved back out of the way and to be

" again heated." "The solder between the two sheets having " been allowed to cool or set, the compound sheet is then to be " clipped or trimmed to make the edges true. When it is de- " sired to coat both sides with copper the process is to be " repeated, and a sheet of copper is to be similarly applied to the " other side of the coated zinc."

[Printed, 3*d.*]

A.D. 1854, July 4.—N° 1471.

JOHNSON, JOHN HENRY. (*A communication from Edmond Charles Bocquet.*)—(*Provisional Protection only.*) "This invention " relates to the chemical or galvanic coating of iron with copper."

The iron surfaces first receive a " slight preservative coating " of copper in a bath containing " cyanate of potassium, and " cyanate of copper." Instead of the preservative coating of copper, one of lead may be given, by means of a bath composed of "oxide of lead (litharge)" dissolved in a dilute solution of potash. The said surfaces are then washed and immersed in a heated acid solution of sulphate of copper, " but not before the " electric battery of this bath has been brought into action." In the latter bath the articles are left some hours in order that they may be coated with a thick coating of copper.

" For effecting the cleaning or preparation of the metal plates " before entering the baths, they are submitted to the action of " dilute sulphuric acid and washed with water; they are then " immersed for a few moments in boiling water. They are next " plunged into a lye of caustic soda, and are finally submitted to " the action of lime, in which substance they are allowed to " remain for several weeks, thereby producing a metallic surface " chemically pure, that is totally void of any foreign matter " whatever."

[Printed, 3*d.*]

A.D. 1854, July 15.—N° 1561.

HUNT, WILLIAM.—(*Provisional Protection only.*) The title of this invention is " Improvements in utilizing certain compounds " produced in the process of galvanizing iron, and in the appli- " cation of the same and similar compounds to certain useful " purposes."

The flux employed on the surface of the melted metal is chloride of zinc, or a mixture of chloride of zinc and sal ammoniac.

The chloride of zinc, "being skimmed off occasionally" is used as a flux again, after the oxide of zinc has been washed out of it, and all the water has been evaporated from it. The oxide may be used for making metallic zinc. If it (the oxide) is contaminated with chloride of zinc, the said chloride is decomposed by the addition of caustic lime, and the muriate of lime is washed out.

The iron to be coated is steeped in a solution of chloride of zinc, and then dried before dipping it into the melted metal.

If a solution of sulphuric acid has been used to clean the iron, the whole of the sulphuric acid is recovered by the following means:—The liquor is boiled to concentration, then transferred "to a close furnace, where the temperature is sufficient to distill "over the free sulphuric acid, and ultimately the sulphuric acid "is roasted off from the iron; in this latter case a little air is "admitted into the furnace." The sulphuric acid is collected "by sending the acid fumes into a condenser filled with pebbles, "and a little water is added from time to time to assist the con-"densation."

[Printed, 3*d*.]

A.D. 1854, July 21.—N° 1606.

CALLAN, NICHOLAS.—This invention consists in:—

1st. "Coating iron of any kind, copper, and brass with an alloy "of lead and tin, in which the quantity of lead is at least twice or "three times as great in weight as that of tin."

2nd. "Coating iron, copper, and brass with an alloy of lead, "tin, zinc, and antimony."

3rd. "Coating iron, copper, and brass with an alloy of tin and "antimony."

4th. "Coating iron, copper, and brass with an alloy of tin with "any two of the other three metals."

The iron, copper, or brass to be coated with any of the above-mentioned alloys may either be tinned first, or it may be (after cleansing) coated at once by dipping into the molten alloy.

The flux used is chloride of zinc, or sal ammoniac, or a mixture of both.

When the alloy consists of tin, lead, and zinc, the quantity of lead should be considerably greater than that of zinc or tin, and the quantity of zinc should be nearly equal to that of tin. In the *foregoing* combinations the quantity of zinc or antimony should

not exceed that of tin, "except in cases in which the coated metal "is exposed to the action of substances of great corroding power, "when the quantity of antimony should exceed that of tin, and "might be equal to or greater than, the quantity of lead, and the "quantity of lead is in such cases diminished in proportion to "the increase of that of antimony."

[Printed, 3*d*.]

A.D. 1854, July 29.—N° 1672.

BURKE, EDMUND, and STOCKER, ALEXANDER SOUTHWOOD.—The title of this invention is "Certain improvements in "the manufacture of metallic tubes and such like articles."

In making gas tubes or water pipes a sheet of iron is coiled round a mandril and secured, "the mandril is withdrawn, and the "tube in this state is immersed in a bath of zinc; the edges and "coils are thus secured and consolidated, and the tube is rendered "incorrodable."

"If tubes or other articles are required of copper or brass, or "any similar composite metal, one surface or both surfaces of the "sheet or sheets of which the tube or other article is to be formed "may be tinn'd or otherwise thinly coated with a suitable sol-"dering material; or the edges and that part of the sheet "corresponding with or coming opposite thereto, after the tube "has been lapped or wound up, may be soldered together or "secured in any similar or suitable manner."

In some cases a heated ferrule, screwed externally, is shrunk on to each end of the tube; the whole is then immersed in a suitable metallic bath. In other cases a short piece of plain tube is shrunk on, galvanized, and screwed "in the ordinary way."

[Printed, 10*d*.]

A.D. 1854, September 7.—N° 1952.

JOHNSON, WILLIAM. (*A communication from Alexandré Désiré Eugene Boucher and Adrien Muller.*)—(*Provisional Protection only.*) "Improvements in coating iron and steel wire with other metals "or alloys."

"The wires to be operated upon are wound upon vertical reels, "situated at one extremity of the machine. From these reels "they pass through a double vessel, containing a solution of "double chloride of zinc & ammonia, or a simple solution of

" chlorhydric acid diluted with water. The second portion of this " vessel serves to receive any acid which may drop from the wires " after immersion, and during their passage through cushions " attached to the vessel. From these cushions the wires proceed " to the metal bath, whether of zinc or tin, the molten metal " being contained in a cast-iron or other suitable vessel placed " immediately over a furnace. On leaving this bath the wires are " entirely coated with metal, & they are then passed through " two steel guage plates, which remove any superabundant amount " of metal, & produce the smoothness of surface desired. The " wires thus coated are then instantly cooled by a number of jets " of cold water."

"The water is applied by passing the wires through tubes, " through which a current of cold water is kept constantly flowing. " After the cooling process the wires are immediately dried, for " which purpose they pass over or through a series of bands or " cushions, and thence into and through the series of tubes which " are enclosed in a metal casing, heated by the waste heat from " the furnace. After emerging from the drying chambers the " wires are wound on to drums."

[Printed, 3*d*.]

A.D. 1854, September 12.—N° 1986.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—(*Provisional Protection only.*) The title of this invention is " Improvements in " baths or receptacles for melting and containing certain metals " for the purpose of coating other metals."

The inventors state :—" Heretofore metals to be used for coating " other metals by immersion have been melted and kept in a " molten state in a vessel made of iron, and one of the evils " resulting from the use of such vessels is, that in the event of such " vessel getting out of order, by cracking or otherwise, the whole " work is stopped. Our invention consists in making baths, pits, " or receptacles (for containing the metals to be melted and to be " kept in a molten state), of brick or other suitable materials ; " and in or against the walls or in the foundations of the pits we " place flues or close fire-places or fire pots, the tops of which, if " in the foundation, and the sides, if in the walls, being in contact " with the metal, give off the heat requisite for melting the metal, " *and keeping it in* a molten state ; and the flues or other fire-

" places are arranged in such manner that they may be inde-
" pendent of each other, and so that, in the event of one giving
" way or getting out of order, the others may continue to give off
" heat, and the metal continued in its molten state. In some
" cases we use only one flue or fire-place, which surrounds the
" pit, and which may also pass under or through the pit, and the
" metal becomes melted by coming in contact with the flue or
" fire-place."

[Printed, 3*d.*]

A.D. 1854, October 23.—N° 2255.

BRADE, ABRAHAM GERARD. (*A communication from Ambroise Auguste Masson.*)—" Improvements in the manufacture of plate " and thread for gold and silver lace and bullion."

This invention is applicable not only to thread, but also to any kind of "metallic plate," " which is a name given by gold lace " manufacturers to flattened wire." These articles may either be silvered or gilt, or covered with any other suitable precious metal.

To give a coating only to one side of the "plate," leaving the other side uncovered or with only a very thin covering, the following process is adopted:—The " plate " is drawn (according to the mode set forth in N° 62, A.D. 1854) "through a suitable metallic " solution with or without the aid of a galvanic current, having " previously applied over that surface of the plate which is not to " be acted upon by the metallic solution any suitable reserving or " resist varnish, or other suitable coating which is not attacked " by the metallic solution, and which may be afterwards removed " from the plate by any suitable solvent; or instead of having " one surface of the plate covered with such a resist coating, this " surface may be applied against the surface of any suitable " smooth body," such as a glass " roller, partly immersed in the " metallic solution."

" Bullion " may be manufactured with plate gilded, &c., according to the above-described modes. " Bullion " " being made " by plate gilded or silvered on one side only, may afterwards be " drawn or immersed in a suitable metallic solution with or without " the aid of a galvanic current, and in this mode receive a further " coating on both surfaces."

[Printed, 4*d.*]

A.D. 1854, December 6.—N° 2561.

FONTAINEMOREAU, PETER ARMAND le Comte de. (*A communication.*)—"Improvements in coating and coloring metals "and alloys of metals," in which metals or alloys of metals are precipitated from cold solutions "without the aid of the battery or "poisonous substances upon metals and alloys of metals."

The principal solutions used are as follows:—

For coating iron.—Tartrate of tin is added to a solution containing a small quantity of the tartrate of copper; this forms a tinning solution; by increasing the proportion of the salt of copper alloys are obtained. A brass solution contains salts of zinc and copper "at their lowest point of oxidation;" the bath is "saturated with chloride of iron." Proto-chloride of iron saturated with chloride of silver forms a silvering solution.

For coating brass or bronze.—A silvering solution consists of chloride of silver, concentrated chloride of calcium, and sal ammoniac, with "other similar chlorides." Lead, iron, tin, platinum, and antimony are deposited from their solution in deliquescent chlorides.

For coating copper and "yellow copper."—The tinning solution is tartrate or chloride of tin. Neutral tartrate of potash and caustic potash colours copper with a purple, yellow, blue, or black tint, according to the duration of the immersion. Alkaline phosphate of potash containing zinc in solution gives a brilliant black; without zinc, a deep blue. Silicate of potash gives a deep blue; with carbonate of potash a deep liver colour. To precipitate zinc, a little copper or other metal should be in solution. "Zinc pre-"cipitates manganese from a saturated solution of chloride of "manganese."

For coating zinc.—A silvering solution is formed by mixing chloride of silver with "other active chlorides" and with deliquescent chlorides, the solution being neutral or alkaline. A solution for depositing iron consists of a solution of a salt of iron. "The coating of zinc with brass is effected, 1st, with phosphates "and alkaline carbonates containing copper; 2ndly, with borates; "3rdly, with chlorides; 4thly with sulphates; 5thly, with ace-"tates & tartrates."

For coating tin.—A salt of copper gives a gold colour to tin.

For coating lead.—"Vegetable and muriatic acids, chlorides,

and alkaline phosphates "can be employed in the precipitation of "metals and alloys on lead."

[Printed, 4*d*.]

A.D. 1854, December 26.—N° 2724.

THOMAS, FREDERICK SAMSON, and TILLEY, WILLIAM EVANS.—"An improved process for plating or coating lead, iron, "or other metals with tin, nickel or alumina."

Tin solutions.—Ferro-cyanide of potassium is added to a solution of tin in nitro-muriatic acid; the resulting precipitate is mixed with sulphuric or muriatic acid, and the whole is boiled in a solution of ferro-cyanide of potassium.

Another solution is made by adding the above-mentioned precipitate to ferro-cyanide of potassium; the mixture is boiled, set aside to cool, and filtered; a stream of "sulphuric" [sulphurous?] acid gas is then passed through the solution.

Nickel solution.—The precipitate, formed in the same manner as that of tin, is added to a solution of cyanide of potassium, and the mixture boiled and cooled.

Aluminum solution.—Ammonia is added to a solution of alum, the resulting precipitate is then boiled with a solution of cyanide of potassium.

In using the tin bath an anode of tin may be employed; and in the nickel and aluminum baths, either an anode of the metal or a bag of the oxide may be used to keep up the quantity of metal in the bath.

[Printed, 3*d*.]

1855.

A.D. 1855, January 3.—N° 18.

JOHNSON, JOHN HENRY (*a communication*).—"An improved "system or mode of coating iron with copper."

The cleansing process consists of immersion in dilute sulphuric acid, washing in cold and then in hot water, dipping into caustic soda, and, finally, placing the article in quick lime for some weeks.

A thin coating of copper is then electro-deposited upon the metal by means of a battery arranged for intensity and a solution consisting of certain proportions of cyanide of potassium and cyanide of copper; hydrogen gas is evolved during this process.

The iron is then washed and plunged into the second bath, "but not before the battery has been put into action." The solution consists of a hot acid solution of sulphate of copper. The iron is covered with a thick coating of copper in this solution.

Instead of using an alkaline copper bath to deposit the thin preservative coating, a lead bath may be employed. The solution consists of potash in which "oxide of lead (litharge)" is dissolved.

[Printed, 4*d*.]

A.D. 1855, February 3.—N° 253.

THOMAS, FREDERICK SAMSON, and TILLEY, WILLIAM EVANS.—This invention consists "in making alloys composed of "any two or more of the following metals, videlicit, silver, tin, "copper, and nickel, and depositing the same upon metals and "metallic substances." "Solutions of the metals of which "the intended alloys are to be composed" are first made as follows:—

Tin.—A solution of metallic tin in nitro-muriatic acid is added to a solution of ferro-cyanide of potassium; the resulting precipitate is dissolved in ferro-cyanide or cyanide of potassium.

Silver.—A solution of silver in nitric acid is added to a solution of "ferro-cyanide of potassium, or common salt, or any suitable "alkali," thus producing a precipitate. "Pearlash or ferro-"cyanide of potassium with salts of tartar and ammonia," are then fused together; the alkali so formed is added to the above-mentioned precipitate and the whole boiled in distilled water.

Nickel.—This metal is treated "in the same manner as the "silver to obtain a solution."

Copper.—Sulphate of copper is added to salts of tartar; the resulting precipitate is added to "the alkali, formed as described "above for the silver." Another copper solution consists of cyanide of potassium charged with copper by means of electric force.

The solutions thus obtained are mixed in such proportions as *may* be necessary to produce the required quality of metal. The

alloys may be deposited from a positive pole of the alloy, or oxides of the metals may be suspended in the bath.

Iron is coated with copper before receiving a coat of the above-mentioned alloys.

[Printed, 4*d*.]

A.D. 1855, February 6.—N° 279.

WARNER, ARTHUR.—(*Provisional Protection only*.) The title of this invention is "Improvements in coating or combining sheet "iron and steel with sheet lead, zinc, tin, copper, or alloys of "such metals."

The inventor states as follows:—

"This invention consists of coating or combining sheet iron "and sheet steel with sheet lead, zinc, tin, copper, or alloys of "such metals, by applying soldering metal between them, and "subjecting them to heat whilst pressed together in a flat or "nearly flat state, the heat being applied through one or both of "the metals, so as to melt the soldering metal which is between "them.

"The soldering metal may be most conveniently applied by "coating one or both of the sheets or pieces of sheet metal, "which are to be combined, though this is not essential."

[Printed, 3*d*.]

A.D. 1855, February 13.—N° 332.

COMFIELD, ROBERT PETRIE (*partly a communication*).—(*Provisional Protection only*.) "Improvements in the electro-"coating of iron and other metals with zinc and other metals."

"Heretofore it has been usual in coating metals by electro-"depositions to employ prepared solutions of the metals to be "deposited; in place of which, I employ solutions of zinc and "other metals produced in galvanic batteries, by which I am "enabled to use what have for the most part been considered "inferior or refuse products in producing the electric currents "employed for coating various metals; and I place the articles of "iron or other metals to be coated into such solutions, and "connect the article in an electric circuit, as heretofore, when "using prepared solutions, by which means the exciting fluid "originally used in a battery will have the metal dissolved "therein deposited on the article, and the fluid may then be

" again used in a battery as an exciting fluid, and thus be again " and again used both in a battery and in depositing metals, by " which the cost of coating metals by electric currents will be " cheapened and improved."

" I amalgamate with mercury metals with which other metals " are coated by electro deposits, with the view to their better " preservation from the action of the atmosphere, acids, acidulated " fluid, salt water, gases, acid fumes, water, and other deleterious " influences."

[Printed, 3*d*.]

A.D. 1855, March 3.—N° 472.

HUNT, WILLIAM.—" Improvements in utilizing certain com- " pounds produced in the process of galvanizing iron, and in the " application of the same and similar compounds to certain use- " ful purposes."

The flux employed is chloride of zinc, or a mixture of chloride of zinc and sal ammoniac. When the chloride of zinc has become contaminated with oxide of zinc, it is skimmed from the surface of the melted zinc, and purified from the oxide; for this purpose the chloride is dissolved out by means of hot water, and the solution thus obtained evaporated to dryness; the resulting chloride of zinc is fit to be used again as a flux. The oxide of zinc may be also converted into chloride by the addition of muriatic acid to it.

A boiling solution of chloride of zinc is used to steep the iron in "before it is galvanized instead of muriatic acid." " The " articles when taken out of the solution of chloride of zinc are " so hot that all or nearly all the moisture is driven from them ' before they are immersed in the melted zinc."

In the Provisional Specification a method of recovering the sulphuric acid used in cleaning the iron is set forth. The spent pickling liquor is boiled "to a concentrated state," transferred ' to a close furnace where the temperature is sufficient to distil " over the free sulphuric acid, and ultimately the sulphuric acid " is roasted off from the iron; in this latter case a little air is " admitted into the furnace." The condensation takes place in " a condenser filled with pebbles, and a little water is added from " time to time to assist the condensation."

[Printed, 4d.]

A.D. 1855, March 5.—N° 484.

JOHNSON, WILLIAM (*a communication from Alexandre Désiré Eugene Boucher and Adrien Muller*).—"Improvements in "coating iron and steel wire with other metals or alloys."

"The machine for effecting the coating is capable of operating "upon several wires or lines of wire at one time, and may be "varied in its dimensions according to circumstances. The wires "to be operated upon are wound upon vertical reels situated at "one extremity of the machine; from these reels they pass "through a double vessel containing a solution of double chloride "of zinc and ammonia, or a simple solution of chlorhydric other-"wise hydrochloric acid diluted with water. The second portion "of this vessel serves to receive any acid which may drop from "the wires after immersion, and during their passage through "cushions attached to the vessel. From these cushions the wires "proceed to the metal bath, whether of zinc or tin or other metal-"lic alloy, the molten metal being contained in a cast-iron or "other suitable vessel placed immediately over a furnace. On "leaving this bath the wires are entirely coated with metal, and "they are then passed through two steel guage plates, which "remove any superabundant amount of metal, and produce the "smoothness of surface desired. The wires thus coated are then "instantly cooled by a number of jets of cold water."

"After the cooling process the wires are immediately dried, for "which purpose they pass over or through a series of bands or "cushions, and thence into and through a series of tubes, which "are enclosed in a metal casing heated by the waste heat from the "furnace. After emerging from the drying chambers the wires "are wound on to drums."

"If it is desired to harden the wires, they may be passed one "or more times through the guage plates or draw plates, with "soap suds or fatty matter."

[Printed, 10*d*.]

A.D. 1855, March 12.—N° 550.

HULLS, JAMES, and LOWE, JOHN.—"Improvements in coat-"ing iron and other metals with lead."

The metal is cleansed by immersion in dilute sulphuric acid, it is then scoured with fine sand, washed, immersed in a solution

of ammonia, and in a solution containing zinc and hydrochloric acid; the metal is then plunged for a few minutes into a solution of sal ammoniac.

The metals are (after the above-described preparation) dipped into the bath of molten lead. If a coating of greater thickness be required, the coated article is "placed in a mould with a space "between the coated article and the mould according to the "thickness of lead required as a further coating; melted lead is "then poured into the mould at a sufficient heat to fuse the pre-"vious coating, with which it combines and gives the thickness of "coating required."

Previous to the cleansing processes above mentioned, cast iron is to be "covered with powdered sulphur, and on this hot ashes "are strewn until the sulphur is dissolved."

If the coated surface of the metal is likely to be exposed to the chemical action of vapours, &c., bi-chloride of tin is substituted for chloride of zinc in the preparatory process.

[Printed, 4*d*.]

A.D. 1855, March 13.—N° 560.

SWINGLER, SAMUEL.—"An improvement or improvements "in the manufacture of certain kinds of metallic spoons, forks, "and ladles."

This invention "relates to such spoons, forks, and ladles, as "are made of iron, and are coated with tin, or other easily fusible "metal or alloy."

This invention "consists in preparing the surfaces of the said "spoons, forks, and ladles for receiving their coating, so that the "said coating shall have a smoother appearance than that effected "by the ordinary method."

"I effect the said preparation of the surface by combining the "processes of rolling and 'pickling,' that is to say, I roll the "blanks, of which the spoons, forks, and ladles are made, both "longitudinally and transversely, and I pickle them or treat them "with dilute sulphuric, hydrochloric, or other acid. By a "repetition of the processes of rolling, cross rolling, and pickling, "I produce a smooth surface on the iron blanks, which gives to "the finished spoon, fork, or ladle, a very superior appearance to "*spoons, forks*, and ladles made by the ordinary process."

" Between the rollings the blanks are annealed from time to " time as occasion may require. The blank prepared as de- " scribed is cut into the form of a spoon," " and the bowl is " afterwards raised and the handle bent by the ordinary methods. " The manufacture of forks and ladles according to my inven- " tion resembles in all essential respects the manufacture of " spoons as described, and will be sufficiently understood from " the description given."

[Printed, 5*d*.]

A.D. 1855, March 17.—N° 598.

ETITJEAN, TONY, and PÊTRE, LOUIS (*a communication*).—(*Provisional Protection only.*) " Certain improvements in the ' manufacture of daguerreotype plates or of electro-plated sheets " of metal, part of which improvements may be applied to the " production of polished surfaces on metallic articles."

This invention " consists of the following method for giving a " perfectly smooth and polished surface to the plates or sheets of " electro-plated copper."

" We first coat one side of a piece of glass, or of substance " similar for its high polish and smoothness (taking care that the " said piece is the size and configuration of the plate or sheet of " electro-plated copper that we wish to produce), with the solution " of a metallic salt, or we prepare the piece in any other manner " that may render it fit to receive the action of the galvanic bat- " tery; we then dip the piece in a trough communicating with a " galvanic battery containing a silver bath, and silver is precipi- " tated on the coated side of the piece; when we judge that there " is deposited a sufficient layer of silver, we then take out the piece, " and place it in another trough containing a copper bath, allow- " ing it to be immersed sufficiently long to have a coat of copper " of tolerable thickness. Instead of plunging the piece coated " with metallic salt in a copper bath, we may plunge it in an iron " bath or other metallic bath, or we may, after the copper bath, " plunge it in a bath of iron, and in fact give it as many layers of " different metals as we please."

" By using proper moulds, metallic articles may receive a high " polish by the above-described process."

[Printed, 3*d*.]

A.D. 1855, March 30.—N° 709.

TYTHERLEIGH, WILLIAM.—"The application of a certain "well-known process to the covering of iron in sheets or bars "with copper or copper alloys, whereby I produce a new and use-"ful product."

"My invention consists in covering iron in sheets or bars, or "articles that may have been wrought into any desired shape "or form, with copper or copper alloys, in the same way in which "iron is brazed together, such as the joints of ordinary iron "tubing, which is done by mixing graines of copper or copper "alloys with borax or other suitable fluxes, and submitting the "same to heat in a suitable furnace or stove, when the copper or "copper alloys will readily melt and incorporate itself with the "iron at the juncture, and when cold a perfect seam or joint is "thereby made. And in like manner I distribute over the surface "of sheet or other forms of iron I may wish to cover any desirable "quantity of copper or of copper alloys, together with the neces-"sary quantity of borax or other fluxes, and submit the same to the "necessary amount of heat, when the graines of copper or copper "alloys will fuse and flow evenly over the surface of the iron I "may desire to cover; and if this process is required on both "sides, the sheet can be reversed and the same process repeated; "and when smooth surfaces are required I pass the sheet or sheets "while hot between a pair of suitable rolls. Or this process may "be done upon a moderately thick sheet of iron, and which "may be subsequently reduced by the process of rolling."

[Printed, 3*d.*]

A.D. 1855, April 11.—N° 795.

OUDRY, LEOPOLD, and OUDRY, ALPHONSE.—"The inven-"tion consists in various methods and manipulations for covering "articles of cast or sheet iron, lead, zinc, and other metals, and "also articles of wood, with a thick and adhering layer of copper, "zinc, lead, or other metal for protecting the same from oxida-"tion and destruction."

In coating large articles of cast or sheet iron, each separate part is electro-coated with the required metal. If the article is rivetted together "the second heads of the rivets made by rivetting" are *electro-coated by placing* the entirely finished article in the requi-

site solutions for effecting that object; or, a bath may be constructed round the article if it is exceedingly large; by this process the thickness of metal on the separate parts is increased. "Local "baths" may be used if it is only desired to coat the rivet heads. If the article is hollow, the second rivet heads are placed inside the work, and the vessel thus formed is filled with the cleansing and depositing solutions in the proper sequence for obtaining the metallic deposit.

"To cover the bodies of vessels," ships, boats, &c.—The internal surface of the shell or body is first electro-coated by placing the requisite solutions therein, the external surface is then coated by placing the vessel in a dock or basin to which the cleansing and coating solutions are separately admitted from separate reservoirs.

"Wooden hulls of vessels, the wood-work for gates of sluices, "jetties, and reservoirs" are varnished, metallized, and electro-coated in a suitable electro-chemical bath.

This invention also consists of the partial application of "a "zinc coating by means of electricity upon non-zinced rivets "for uniting pieces zinced by immersion in a molten bath of "zinc."

[Printed, 4d.]

A.D. 1855, May 18.—No. 1123.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"An im-"provement in coating wrought iron."

"Our invention consists in obtaining to sheets or plates or other "forms of wrought iron a coating of tin from a solution, as is "well understood, in omitting the dipping in melted tin or its "alloy or zinc, and in afterwards applying a non-metallic coating "or coatings of a material or compound which is repellant of "moisture, and which may be used at so low a temperature as to "leave the iron as nearly as possible with its original form and "toughness. We prefer for such coating or coatings a resinous or "such like matter as will not interfere with, or will rather aid the "process of soldering the iron when it may be desired to do so; "by which means we obtain a manufacture of tinned wrought "iron in sheets, plates, and other forms suitable for a great variety "of uses at a considerably reduced cost."

For the purposes of this invention, solutions of tin, "whether by the aid of a galvanic battery or not," may be employed.

[Printed, 4d.]

A.D. 1855, June 4.—N° 1273.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improve-
" ments in coating sheets of wrought iron."

"The object of this invention is so to protect cleaned surfaces " of sheets of wrought iron, that they will admit of being " soldered without requiring to be coated with tin. And the " improvements consist in either applying a coating of the pro- " tecting substances hereafter mentioned, directly on to the " cleaned sheets of iron, or else indirectly, by first depositing " thereon a coating from solutions of copper, lead, zinc, bismuth, " cadmium, or antimony, and then protecting the surfaces so " coated with the substances hereafter mentioned. For these " purposes the sheets of wrought iron are to be first cleansed by " dilute acid in the ordinary manner, then (either coated or not by " depositions from the metallic solutions above mentioned) they " are to be covered over with some one or more of the following " substances in a solved or melted state, viz., turpentine, resins, " lac, gums, oil, grease, gelatinous or bituminous matter. By " these means sheets of wrought iron may be prepared and " retained in a clean state, so as to admit of being soldered at a " distant period after they have been prepared."

[Printed, 4*d*.]

A.D. 1855, June 5.—N° 1276.

PULS, FRANCIS.—"Improvements in electro-coating iron."

This invention consists of "coating iron by a cheap process " with zinc in solution," by means of electricity.

The intensity or quantity of the electric current from the battery is proportioned "to the surfaces of the iron to be coated, thus " causing the zinc to be deposited upon the iron in the smallest " possible particles or atoms, thereby securing a perfect adhesion " of the zinc to the iron." The resistance against the electric current in the bath should be equal to that in the battery.

The following solutions of zinc are employed:—"A weak " solution of the sulphate or hydrochlorate of zinc, or double or " treble salts of the same, with potash, soda, and ammonia."

The amount of dilution of the battery solution should be in a certain ratio to that of the depositing solution.

This invention also consists in re-using "the exhausted fluid

" from the bath in the battery, and that from the battery in the " bath." " The said solutions are to be changed when the solu- " tion in the battery has become saturated with zinc, and the " solution in the bath exhausted of zinc, by substituting one for " the other."

[Printed, 3*d.*]

A.D. 1855, July 10.—N° 1543.

ELKINGTON, CHARLES JAMES CHEATLEY.—(*Provisional Protection only.*) The title of this invention is " Improvements in " depositing alloys of metals."

The inventor states:—

" This invention consists in depositing alloys of metals, by " employing a bath of a solution of the metal in the particular " alloy which is most difficult of deposition, and in supplying to " this bath the metal or metals which are more easy of deposition " only as they are required. And this I do, by preference, by " placing into the bath a pole, consisting of an alloy of the metals " which I wish to deposit; but the metals which are easy of " deposition may be supplied to the bath by other convenient " means, if preferred. The article to be coated is placed in the " bath and connected with the zinc or negative pole of the " battery in the ordinary manner; and part of my invention " consists in depositing alloys of nickel and silver with or with- " out the addition of copper, zinc, or tin."

[Printed, 3d.]

A.D. 1855, August 1.—N° 1740.

BRITTEN, BASHLEY.—The title of this invention is " Improved " projectiles."

Projectiles are adapted to " the principle of the rifle or spirally- " grooved gun," by coating them with soft metal in the following manner:—" The iron is first coated with zinc by the process " commonly known as the galvanising process, and while suffi- " ciently hot to keep the zinc in a fused state on its surface, it is " plunged into a mould or vessel of suitable form containing the " lead or other soft metal in a fused state, and then allowed to " get cold. Care must be taken that the surfaces are free from " tarnish or oxide, and the lead should be as near as possible of " the same temperature as the zinc."

This invention also consists of "the distribution of the material " of which the projectile is made, in such a way that the centre " of gravity shall be in front of the greatest diameter, so as to " ensure the steady flight of the projectile with the point first."

[Printed, 3*d*.]

A.D. 1855, August 30.—N° 1956.

GEDGE, JOHN (*a communication from Jacques Joseph Hippolite Mailly*).—(*Provisional Protection only.*) "Improvements in gal- " vanizing substances."

This invention relates to electro-coppering articles by the single cell process, that is, without a separate galvanic battery.

The depositing solution used in the outer cell is a neutral solution of sulphate of copper.

In regard to preparing the article, the inventor states:—"I " propose to prepare the article to be galvanised by first well " pouncing it and cleaning it with alcohol, then with a strong " open brush to brush those parts intended to be galvanised, first " powdering them well with plumbago. Where there is open " work I take a slip or strip of new chamois leather well covered " with plumbago, working it through the holes or open work, so " that the whole shall become perfectly black and shining."

"At the expiration of two or three hours the object ought to " be slightly covered, and should be allowed two or three days to " perfect the coating. When taken from the bath the objects " should be well pounced, brushed, and cleansed before being " gilded or silvered."

[Printed, 3*d*.]

A.D. 1855, September 4.—N° 1997.

TAYLOR, JOHN GEORGE.—(*Provisional Protection only.*) "Im- " provements in coating, covering, or plating metallic surfaces."

"This invention relates to the application and use of the " metal or metallic earth aluminum, otherwise aluminium, as a " material for coating, covering or plating metallic bodies or sur- " faces. It is intended to apply the aluminium for this purpose " either by the action of electricity, magnetism or galvanism, or " by the old system of plating with sheets. It is preferred, how- " *ever, to effect the* application or deposition of the aluminium by

" means of electricity or electric agency, the aluminium being " thus applied either as a coating to base metals, or as a preser- " vative film or covering to the precious metals. In addition to " these applications of aluminium as in" [an?] "ornamental " coating, or as a preservative for ornamental surfaces, it may be " applied for preserving ships' sheathing, as well as for protecting " a great variety of other metallic surfaces which are liable to " injury from the atmosphere, from gases, from liquids, or from " direct chemical action."

[Printed, 3*d.*]

A.D. 1855, September 15.—N° 2084.

SCULLY, VINCENT, and HEYWOOD, BENNETT JOHNS.—(*Provisional Protection only.*) This invention relates to the use of " aluminium" for preventing "the rapid destruction or deterio- " ration of certain articles composed of metals or alloys of metals, " by reason of the chemical action set up by contact with the " atmosphere and moisture."

"As it is capable, when burnished, of retaining a bright " metallic lustre, we propose to employ it in the manufacture of " medals, coins, plated goods, and articles of virtu, such articles " being either stamped in dies, or cast and chased, after the " manner of the silversmith in producing statuettes, or manu- " factured after the manner of repoussé work, or coated by the " electro-deposition process."

Other methods of employing aluminum for the above purposes are set forth.

[Printed, 3*d.*]

A.D. 1855, September 17.—N° 2097.

TURNER, NOAH.—(*Provisional Protection only.*) The title of this invention is " Certain improvements in the manufacture known as " ' gold wire ' and ' gold plate,' for the production of gold thread " or gold lace."

The inventor states:—"Hitherto 'gold wire' and 'gold plate' " (so called) have been manufactured by coating or plating silver " wire with thin gold as a covering during the process of drawing " and manufacturing to economize the cost of the production. " My invention consists in substituting the metal called or known " as 'aluminium' in place of the silver wire in this manufacture,

" which has exactly the same effect in the 'gold wire' or 'gold " 'plate' produced, and tends also much further to economize the " cost of the article."

[Printed, 3*d.*]

A.D. 1855, October 4.—N° 2215.

CORNFORTH, HENRY.—" A new or improved manufacture " of hooks and eyes."

This invention relates to making hooks and eyes of iron or steel, and then electro-silvering them.

It is preferred to electro-copper them first by means of a boiling solution " of cyanide of copper."

The silver solution is composed of " a solution of cyanide of " silver;" if only a thin coating is required, an electric current is not employed.

"The hooks and eyes should be cleaned by immersion in dilute " sulphuric or hydrochloric acid, or otherwise, before being " coated with copper; and when an electrical current is employed, " I prefer to place the hooks and eyes in a revolving metal cage " or case, or in a metallic sieve, or I thread them on a wire, " which said cage or case, sieve or wire must be immersed in the " solution. The use of the said cage or case, sieve, or wire is to " establish that metallic communication between the hooks and " eyes and the wire conveying the electrical current which is " necessary in the electrical deposition of metals. In all other " respects the process of coating the hooks and eyes is conducted " according to the ordinary methods of coating metals by " electricity."

[Printed, 3*d.*]

A.D. 1855, October 12.—N° 2280.

PULS, FRANCIS.—(*Provisional Protection only.*) " Improvements " in electro-coating metals or alloys of metals with other metals " or alloys of metals."

" I construct galvanic batteries of any suitable description, in " which the positive plates consist of the metals or alloys of " metals with which the articles are to be coated.

" I employ for exciting fluids such acids or mixtures of acids " *in a diluted state* as may be found suitable in each instance to

" the metals operated on, as, for example, diluted sulphuric, " nitric, or hydrochloric acids, or a mixture of the same, and I " place the batteries thus formed and furnished with exciting " fluid in a suitable trough, in conjunction with the articles to be " coated, and so adjusted that the solution of the metals or " alloys of metals obtained from the positive plates of the " battery can freely pass to the articles to be coated therewith, " and thereon deposit the said substances through the agency of " the electric current created by the same batteries."

[Printed, 3*d*.]

A.D. 1855, October 18.—N° 2340.

STIRLING, JOHN DAVIE MORRIES.—The title of this invention is " Improvements in coating silver, copper, zinc, and iron, and " alloys of those metals."

The inventor states :—

" This invention has for its object the coating of silver, copper, " zinc, and iron, or alloys of those metals, with aluminium, by " means of pressure. For this purpose a sheet of the metal to be " coated, and a thin sheet of the coating metal, their surfaces " being clean, are to be brought in contact, and caused to join " together by great pressure, using heat when necessary."

" Having thus stated the nature of my said invention, I will " proceed more fully to describe the manner of performing the " same.

" It is well known that various metals have been before com- " bined into compound sheets by rolling two different metals " together, and the means of performing the process are well " known; I do not, therefore, claim the rolling of two different " metals together in order to obtain a compound sheet thereof. " But my invention is confined to the coating of silver, copper, " zinc, or iron, or alloys of those metals, with aluminium, and " making compound sheets by the simple process of rolling, and " using heat when necessary."

[Printed, 3*d*.]

A.D. 1855, November 7.—N° 2504.

ADVIELLE, LOUIS BÉNOIT.—" An improved process for silver- " ing metallic articles."

" Argentine water " is produced by adding a certain proportion

of whiting to cyanuret of silver; "cream of tartar, talc, or other "analogous substances may be employed as substitutes for "whiting."

This composition is applied to the silvering of metallic articles as follows:—The articles are immersed in a bath composed of dilute "argentine water;" or if the article be large it is wetted with the argentine water by means of a piece of linen. "Care "must be taken to shake the bottle, to stir up the whiting which "is precipitated. When the article is well impregnated with the "liquid, it is to be rubbed with very dry whiting, and when it has "received a good coating of material, it is to be washed and "rubbed with a dry cloth, and the article will assume a white and "brilliant appearance. The proportion of 'argentine water' to "the water in the bath may be augmented, and the silvering will "be more solid, but the process then becomes dearer and not so "prompt."

[Printed, 3*d*.]

A.D. 1855, November 14.—N° 2571.

NEWTON, ALFRED VINCENT (*a communication*).—This invention is entitled "An improved manufacture of electrotype "printing surfaces," and it relates:—

1st. To a method of making electrotype casts.

2nd. To a method of making the mould or frame, so as greatly to facilitate the backing up of the electrotype casting. Under this head of the invention, a method of tinning and of casting type metal on to the electrotype is set forth.

The article to be electrotyped is placed in a common printer's chase and surrounded with rules of the same height; a flat margin is thus formed on the electrotype casting. When finished, the electrotype is removed from the printer's chase, tinned on the back, and placed in a mould having a bed-plate, top-plate, and clamps; a frame, with bevilled edges, is also made to fit the sides of the electrotype, the depth of the said frame being the same as the height of the ordinary type matter in printers' forms.

"In using the mould it is essential that all the parts should be "well heated, so as to fuse the tinned surface of the shell, and pre-"vent the type metal from being chilled too suddenly on being "poured into the mould.

[Printed, 6d.]

A.D. 1855, December 3.—N° 2721.

WATT, ALEXANDER.—"An improvement in coating iron and "steel with zinc."

This invention relates to a "method of preparing a solution of "zinc (suitable for coating iron and steel with zinc) by means "of electricity."

A solution containing certain proportions of cyanide of potassium and liquid ammonia is charged with a certain proportion of zinc by electric force; a certain amount of a solution of carbonate of potash is then added to the above-mentioned solution, and the clear portion of the resulting solution is fit for use.

"This solution is to be worked with a zinc anode and brisk "battery power when depositing on iron or steel."

[Printed, 4d.]

A.D. 1855, December 6.—N° 2756.

THOMAS, FREDERICK SAMSON, and TILLEY, WILLIAM EVANS.—"Improvements in producing aluminium and its alloys, "and in plating or coating metals with aluminium and alloys "composed of aluminium and other metals."

This invention consists in depositing aluminum and its alloys from certain aqueous solutions of its salts, by means of electric currents.

No. 1. Solution of alumina.—Calcined alum and cyanide of potassium, in certain proportions, are dissolved in water by boiling.

No. 2. Solution of alumina.—The precipitate resulting from mixing solutions of alum and salts of tartar is boiled in an iron vessel with a solution of cyanide of potassium.

No. 3. Solution of alumina.—The precipitate resulting from the addition of ammonia to a solution of alum is treated in the same manner as stated in No. 2.

No. 4. Solution of alumina.—The precipitate obtained by adding carbonate of potash to alum (both being in solution) is roasted and melted with cyanide of potassium; a certain amount of carbonate of soda is then added and fused; the solution of the mixed ingredients in water affords the electro-depositing solution.

Aluminum is electro-deposited either by an anode of aluminum, or by an anode of platinum and a bag of alumina to replenish the solution. An electric current of considerable intensity is used in connection with the above-described solutions.

No. 5. Solution of aluminum and silver, or of aluminum, silver, and copper.—Solution No. 3 is charged with silver, or with silver and copper, by means of electric force.

No. 6. Solution of aluminum and tin.—Solution No. 4 is worked with a positive pole of tin and bag of alumina. Another method consists in adding to the fused materials set forth in No. 4, the precipitate obtained by adding salts of tartar to a solution of tin in nitro-muriatic acid; after the ingredients are mixed by fusion, they are dissolved in distilled water. A third method consists in fusing together dried alumina, cyanide of potassium, carbonate of soda, and oxide of tin; this compound is dissolved in water.

No. 7. Solution of aluminum and nickel.—Solution No. 3 is worked with a positive pole of nickel. Another method consists in placing in the bath the precipitate obtained by adding ferro-cyanide of potassium to a solution of nickel in nitro-muriatic acid. A third method of forming this solution consists of boiling the following ingredients together:—The precipitate formed by adding carbonate of potash to a solution of nickel in nitric acid, carbonate of ammonia, and "oxide of alumina, prepared according to No. 3."

No. 8. Solution of aluminum and copper.—"Dried alumina," cyanide of potassium, carbonate of soda, and "sulphurate" [sulphate?] of copper are fused together; the resulting mass dissolved in water forms the solution.

No. 9. Solution of aluminum, copper, and zinc.—Sulphate of zinc is fused "with the alloy of alumina and copper, as described "in No. 8;" the whole is then dissolved in water."

No. 10. Solution of aluminum, silver, and tin.—Solution No. 4, with excess of cyanide of potassium, has certain precipitates of "oxides" of silver and tin added to it.

No. 11.—Solution of aluminum and iron.—"Oxide of iron" (precipitated from sulphate of iron by salts of tartar) is dissolved in the alumina bath by boiling.

No. 2724 (A.D. 1854) is referred to.

[Printed, 5*d*.]

A.D. 1855, December 14.—N° 2824.

PHILIPPI, WILLIAM.—(*Provisional Protection only.*) The title of this invention is "Improvements in coating iron with tin."

The inventor states as follows:—

"The principal feature of novelty of these improvements consists in the use and employment of a solution of chloride of zinc in lieu of grease, as commonly employed in the process of 'tinning' iron, for excluding the contact of air with the molten tin, by placing said grease on the surface thereof."

"By these improvements the coating of the iron will be quite as efficiently performed as by the use of grease, with this advantage, that whereas by using grease in the above process the tinned surface is dull, by these improvements the surface retains a high polish, and thus constitutes an improvement in coating iron with tin."

[Printed, 3*d*.]

1856.

A.D. 1856, February 7.—N° 331.

BERGNER, THEODORE (*a communication from Samuel W. Lowe, of Philadelphia*).—(*Provisional Protection only*.) "A new mode of preparing or facing the surfaces of engraved or etched plates of metal or other substance, so that they may be readily printed from by a press without wiping."

This invention "consists in coating or amalgamating with mercury the unengraved parts of the surface of any engraved or etched plate of metal, or other substance, capable of receiving or being made to receive or amalgamate on the surface with mercury."

Steel plates have all the engraved or etched parts filled up with resin, leaving the unengraved surface bare; the bare surface is then electro-coppered and mercurialized.

Copper plates are treated the same as steel plates, except that no electro-deposit of copper is made.

Common tin plate is prepared for engraving and mercurialized as follows:—It is first coated over with etching ground; the design is then drawn with the usual etching instruments, and the etching accomplished by means of nitro-muriatic acid; the acid is washed off, the etching ground removed, and the mercury rubbed on; the plate is then ready for the press. Instead of being

etched, the tin plate may be engraved through to the iron with a graver.

When copper plates are to be amalgamated, it is preferred to use an amalgam of tin instead of pure mercury.

Steel plates may be amalgamated by means of a solution of sal ammoniac; a sheet of tin foil is then pressed in contact with the mercurial surface, and left undisturbed. When the tin foil is fixed, the surface is again rubbed over with mercury.

[Printed, 3*d*.]

A.D. 1856, February 14.—N° 385.

MOREWOOD, EDMUND, and ROGERS, GEORGE.—"Improve "ments in drying and coating iron and copper."

1st. "Drying or partially drying sheets or suitable forms of "iron or copper after they have been placed in a bath to be "cleansed, or to be coated by deposition of metal, by causing the "same to pass between pressing rollers." It is preferred to use a series of four pairs of wrought iron rollers, placed horizontally, the last three pairs of rollers being hollow, and heated by steam.

2nd. "Causing sheets or suitable forms of iron or copper "(coated or uncoated with other metal), when coating them with "varnish or water-repellant matters (as described in the Specifi- "cation of former Patents granted to us), to be subjected to "pressure between rollers to equalize the varnish or water- "repellant coating thereon."

3rd. "The peculiarity of this part of our invention consists in "using bars, racks, rods, or wires which are fixed and immersed "in the coating fluid, and which act as stays or supports to the "iron or copper to be coated in the solution, and enable us to "move such iron or copper in the solution with great facility, and "at the same time aid electrically in causing metal to be de- "posited from solution upon the pieces of iron or copper." If coating with zinc, a solution of chloride of zinc is used in connection with rods of zinc; if coating with tin, a solution of chloride of tin is used in connection with rods of tin. The electric action may either be excited by the contact of the iron or copper plates with the above-mentioned rods, or by means of a separate galvanic battery.

[Printed, 4d.]

A.D. 1856, April 15.—N° 899.

SOUTHBY, EDMUND RICHARD.—"An improvement in coating "iron with copper."

The peculiarity of this invention is, that the articles of wrought iron, cast iron, or steel, are treated with a hot alkaline solution, previous to "depositing copper thereon."

The process for carrying out this invention is as follows:—The article is first prepared by pickling in an acid solution, dipping into a weak alkaline solution, drying, and scouring with sand. The said article is then treated with a hot solution of carbonate of soda, being immersed therein for about an hour. At the end of this time, the article is removed from the alkaline solution, and immediately placed "in the coating bath." The coppering bath consists of a hot electro-depositing solution, containing cyanide of potassium and oxide of copper.

"In place of preparing the article for receiving the coating of "copper by means of a separate alkaline solution, the solution "which is used in the coating bath being alkaline may be used "for this purpose, the article being kept heated for some time in "this bath before the deposition is commenced, and this process "has advantages in coating large masses of iron."

[Printed, 3*d*.]

A.D. 1856, April 18.—N° 923.

TYTHERLEIGH, WILLIAM.—"A new or improved method of "coating or covering iron, or articles of iron, with copper or "alloys of copper."

The article is cleaned by any of the well-known processes; it is then immersed in a "pan, vessel, or crucible," containing the fused copper or alloy of copper, together with a flux. The said pan or crucible is then agitated, until the articles acquire a uniform temperature, and the copper or alloy is attached thereto. When the coated articles are removed from the pan, they are put into a sieve, or upon a plate of iron, and stirred about, "until "they have cooled sufficiently to prevent them adhering to one "another."

"If the pieces of iron or articles to be coated are too large to "permit of the shaking of the pan or crucible, then the said pan "or crucible is allowed to remain stationary in the fire or furnace, "and the iron or articles are moved about in the fused metal

" contained in the pan by means of a pair of tongs or other " implement."

Instead of fusing the copper or alloy with borax or other flux, before putting the iron or articles into the pan, "the iron or " articles may be first placed in the pan and heated before the " copper or alloy is put into the said pan."

[Printed, 3d.]

A.D. 1856, May 21.—N° 1201.

DUFRESNE, ALEXANDRE HENRI.—" An improved process of " gilding and ornamenting steel and other metals."

This invention "relates to the gilding, silvering, and orna- " menting of metals not susceptible of direct amalgamation," and consists:—

1st. " In the employment of one or several intermediate metals, " deposited either by chemical, electro-chemical, or mechanical " processes, on the metal to be gilded, silvered, or ornamented."

2nd. In the application of photographic processes for making the reserves upon the intermediate metals.

3rd. " In the destruction of the intermediate unreserved metals," either " so as to preserve the polish, or to act on the surface of the " metal to be gilded, silvered, or ornamented, for the production " of flat and relievo designs."

4th. In the removal of the reserves.

5th. " In gilding or silvering the surfaces by means of mercury," " and finally the volatilisation of the mercury by heat."

"To operate on iron or steel."—The surface of the metal is covered entirely with a coating of copper; the design is then formed, by the action of light on bitumen of Judea, the article is immersed into chromic acid, to dissolve off the unprotected portions of the copper, and the varnish is removed by means of hot turpentine. The gilding or silvering of the design is then effected by amalgamation, and the mercury is finally driven off by heat.

"To operate on platina."—A similar means to that employed for iron or steel is used.

"To operate upon silver."—A triple metallic coating is deposited on the silver surface; first, copper; second, iron; third, copper. The reserves are formed on the last coat of copper, and " *the unreserved* parts of the superposed metals " are destroyed in

succession, "so that the iron which presents itself, on removal of "the upper coat, prevents the mercury from adhering to the first "copper or silver surface during the amalgamation." "Instead "of interposing an iron coating between two coats of copper, I "can employ, and in most cases more advantageously, a surface "of nickel or antimony, which are readily acted on by chromic "acid. In this case I remove the last surface of copper by an "ammoniacal solution, which has the advantage of leaving the "silver untouched."

"Heliographic" and printing processes can also be used for the production of the reserves.

[Printed, 3*d*.]

A.D. 1856, May 24.—N° 1243.

BARRON, PIERSE EUSTACE LAURENCE (*a communication*).—"An improved process for coating metals for sheathing ships, and "for other purposes, and in the means of attaching sheathing "plates to ships or vessels."

The sheet or article to be coated is securely held, "and by hand "labor, or by means of a mechanical arrangement similar to that "used in planing machinery for traversing the cutting tool," a suitable metal or alloy, of any convenient size and shape, is forced "over the surface of the iron or other metal to be coated, and by "means of the friction created between the two metals during "the passage of the soft metal or alloy of metals over the iron or "other metal, the former will be partially fused and abraded, and "will leave a coating thereof on the iron or other metal to be "coated. This operation will be facilitated by the application of "artificial heat to the soft metal or alloy of metals."

The alloys proposed to be used "for the purposes of this inven-"tion are composed of two or more of the following metals, viz^{t}, "copper, tin, nickel, lead, zinc, antimony, and bismuth, mixed in "various proportions, according to the degree of fusibility "required."

In order to sheath iron ships, metal strips or pieces are secured "to the sides of the ship or vessel, beginning at about the water "run," between which metal strips and the sides of the ship the sheets of sheathing metal "are inserted, and afterwards secured "therein in any convenient manner."

[Printed, 1*s*. 4*d*.]

A.D. 1856, June 2.—N° 1308.

NASMYTH, JAMES, and BROWN, JAMES.—"Improvements "in apparatus for the manufacture of tin plates."

These improvements consist "in driving the rolls through which "the plates are passed at different surface speeds; or, in the em- "ployment of rolls of different diameters driven at the same "speed, whereby the plates are smoothed, and the burnishing and "planishing thereof effected before or after being tinned, or both "before and after being tinned."

Another improvement "consists in imparting to the rolls "through which the plates are passed a reciprocating or to-and- "fro motion to one or both of the rolls in the direction of the "axes thereof. When both rolls are made to reciprocate," they are caused "to move to and fro in a contrary direction to one "another." One of the modes whereby "the end-way movement "of one or other of the pair or set of rolls" is effected, consists in giving to each end of the roll "a certain degree of skew on "alternate diagonal inclined surfaces," so that during the rotation of the roll fixed rubbing blocks "may induce the required degree "of end-way motion for the purpose and objects described."

[Printed, 5*d*.]

A.D. 1856, October 21.—N° 2472.

ATKINSON, ROBERT DAVISON (*a communication*).—(*Provisional Protection only.*) The title of this invention is "Improvements "in preparing and coating metallic surfaces."

The inventor states:—"My invention, which has reference to "an improved method of preparing and coating metallic surfaces, "such as iron and lead, so as to preserve them from oxidation, "and enable them to be employed as substitutes for the more "expensive metals as at present in use for various purposes, such "as coppering ships' bottoms, pans, boilers, bars, bolts, tubes, or "otherwise, consists, firstly, in depositing copper or brass upon "surfaces of iron previously prepared, by being melted in con- "junction with carbonic acid gas, and either coating or covering "them with a brush or through the medium of galvanic agency, "employing for the said purposes melted copper or brass, or "solutions, or water containing salts of the same; and, secondly, "*in employing sulphate* or sulphuret of lead as a coating to pre-

" serve the surfaces of lead from atmospherical and other in-
" fluences."

[Printed, 3d.]

A.D. 1856, November 21.—N° 2768.

CLARK, ALEXANDER.—The title of this invention is " Improve-
" ments in the application and construction of revolving window
" shutters and blinds, and metal window sashes."

The first five portions of this invention consist of certain mechanical arrangements of the above-mentioned shutters and blinds, and of certain applications of the same.

" The last part of my invention relates to coating or plating
" iron or other metal sash bars or stall plates (the lower bars or
" plates) of windows with brass, in order to lessen the expense of
" those articles.

" To effect this I first 'draw' in a draw bench or otherwise
" form the iron sash bar or stall plate of the requisite form, which
" is afterwards smoothed, cleaned, and turned " [tinned?] " on
" the side to be coated with brass. While the iron bar is in a
" heated state, so as to keep the tin melted, I apply thin sheet
" brass to the tinned surface, and by rubbing with a burnisher,
" cause it to adhere to the iron, precisely in the manner now prac-
" tised in plating the iron furniture of harness and other articles
" with brass. The brass, when cold, may be polished up, and will
" have all the appearance of solid brass sashes and stall plates."

[Printed, 11d.]

A.D. 1856, November 26.—N° 2805.

NEWTON, ALFRED VINCENT (*a communication from Joseph Poleux, of New York*).—" An improvement in the process of
" coating iron bolts, bars, sheets, spikes, nails, and other articles
" of iron with metallic alloys, for the prevention of rusting
" or oxydation."

The solution used for cleansing the articles consists of concentrated acid, in which a small quantity of spelter is dissolved.
" The acid acts at once and rapidly on the spelter, holds in solu-
" tion what it dissolves, and precipitates a film of it on the
" minutest portions of the iron surfaces the instant the acid has
" cleansed them, and this film protects such portions from any

" further action of the acid while remaining in it." Muriatic acid is preferred to nitric or sulphuric acid.

" The articles are next taken out, and without being washed, " dried, or undergoing any other treatment whatever, are passed " immediately, though slowly, into the bath of melted alloy that " forms the coating."

" The following proportions give the alloys now in use by the " inventor," for coating the above-mentioned articles by immersion in the fused alloy, " vizt: of one hundred parts, fifteen are of " tin, seventy-five of lead, five of copper, and five of regulus of " antimony; or tin fifteen per cent., and lead eighty-five per cent."

[Printed, 3*d*.]

A.D. 1856, December 17.—N° 2992.

COWPER, CHARLES (*a communication from Louis Isidore Caussinus, of Paris*).—(*Provisional Protection only*.) This invention is entitled " Certain improvements in electro-plating."

Certain proportions of cyanide of copper and cyanide of potassium are dissolved in water; to this solution a solution containing cyanide of silver and cyanide of potassium is added; the mixed solution is heated for an hour, " and this forms the silvering bath " for electro-plating."

A piece of carbon is used as the anode in this solution, " and " this carbon is immersed in the silvering bath to a depth which " can be adjusted by a slide, so as to regulate the action. The " bath may be used hot or cold. The objects are allowed to " become covered with copper, and they are then agitated several " times in the bath until the copper is replaced by silver. They " are then scratch-brushed, and again placed in the bath and " treated in a similar manner. If a thicker coating is required, " it is effected by subsequently submitting them to the ordinary " electro-plating processes. The proportions and details of the " process admit of variation. By this means zinc, lead, tin, and " wrought and cast iron, and other metals may be advantageously " electro-plated."

[Printed, 3*d*.]

A.D. 1856, December 22.—N° 3023.

PAYNE, WILLIAM JAMES.—This invention " consists in lining " *the barrels and coating* the plugs of ordinary or other cocks or

" taps with molten zinc, or any other molten metal or metallic " alloy possessing sufficient fluidity in its molten state and suffi- " cient hardness and lubricity when set to resist abrasion when " the cocks or taps are in use," whereby the inventor is enabled " to make ordinary or other cocks of iron, coated or galvanized " with zinc or tin, or of any suitable material not readily cor- " rodible by the action of the atmosphere, or by the action of the " liquids and fluids, for which such cocks may be used."

The barrel of the cock and the part which receives the plug are lined with an alloy of zinc and tin by the following means:—A steel die or core of the size and shape of the intended plug, and a core of the same size and shape of the bore of the cock, are held in their respective places by means of " hinged jaws," having a shape, when closed, corresponding to that of the iron or other body of the cock and having provision for running in the coating alloy; the alloy is then run into the intermediate spaces left between the body of the cock and the cores, the " hinged jaws" and cores are withdrawn, and the superfluity of metal is removed.

The plugs are similarly coated by means of a steel mould or cylinder, into which a core fits that provides the passage through the plug corresponding with the duct through the barrel of the cock.

Instead of coating the iron plugs in a steel cylinder, they may be coated with brass or gun metal in a mould of sand, " in which " case the iron plug to be coated is not continued below the top " of the aperture or duct through the plug."

[Printed, 7*d*.]

1857.

A.D. 1857, January 23.—N° 203.

BEDSON, GEORGE.—" Improvements in coating iron and other " metals with metals or metallic compounds."

The inventor states :—" My invention relates to the coating " of metals after that manner known as galvanizing or tinning, that " is to say, the articles are passed through a bath of the molten " metal intended to form the coating, and consists in the applica- " tion of certain substances floating upon the said baths. For this

" purpose I employ salts of zinc, of which I have found the chloride " and sulphate to answer ; with these other substances, as common " salt, chlorides of lead, manganese, &c. may be combined for the " purpose of causing the metal to run freely without affecting the " principle of my invention."

[Printed, 3*d*.]

A.D. 1857, January 27.—N° 240.

BOUSFIELD, GEORGE TOMLINSON (*a communication*).—" Im- " provements in coating iron or other metals with tin ;" a solution of a salt of tin is used for this purpose.

The solution contains certain proportions of " the cream of tar- " tar of commerce," " common whiting," and " the common tin " salt of commerce ;" the whole is made to boil " so as to perfect " the solution and admixture." This bath is to be used at a temperature of " about 160° Fahrenheit, which is best done by the " introduction of steam."

The metal to be coated is first cleaned " by any of the well- " known means of removing rust or dirt ;" it is " then immersed " in the mixture together with scraps of zinc, about two pounds " weight or more, and immediately pure tin will be precipitated " upon the surface, forming a perfect coating so intimate as to " protect the metal from the action of humidity or of salt water, " or the same effect will be produced if the whole vessel were of " zinc instead of introducing scraps of that metal. The thickness " of the coating will be determined by the length of time the " articles are in the bath, but in eight hours the quantity depo- " sited will be sufficient for most practical purposes."

In the Provisional Specification it is asserted that " steam is " chief agent in exciting the action which precipitates the tin " from the solution." [Is not electric action the agent ?]

[Printed, 3*d*.]

A.D. 1857, February 10.—N° 386.

BEDSON, GEORGE.—" Improvements in coating metal with " metal and metallic compounds."

The inventor states :—" My invention relates to that method " of coating metal known as tinning or galvanizing, and consists " *in* the application of certain substances floating on the bath of " *molten metal* and through which the articles are passed. For

" this purpose, instead of the salammoniac or tallow, commonly " used, I employ salts of tin, of which I prefer the chloride, per- " chloride, and sulphate; with these other substances may be " combined, for the purpose of causing the metal to run more " freely, as for instance, common salt, without departing from the " principle of my invention."

[Printed, 3*d.*]

A.D. 1857, March 10.—N° 700.

HAMILTON, JAMES.—" Improvements in coating iron and other " metals with metallic substances."

1st. " Coating iron or other metals with lead, or with com- " pounds of lead and other metals, in which compounds the lead " is two-thirds of the whole or more in quantity."

If " a coating of lead only upon a sheet of iron " be desired, the iron is first tinned or galvanized " by any of the ordinary " methods," and then dipped into a bath of molten lead. Upon this bath a floating stratum of tallow is used.

The alloys used consist of certain proportions of mercury and lead, or of tin and lead. The cleaned article is coated with muriate of zinc or with sal ammoniac and resin, " after which it is passed " into a bath of the molten metal and out through a layer of sili- " cious sand or carbonaceous substance of similar mechanical " properties, the treatment being similar to that known as " galvanizing."

2nd. To coat iron and other metals with " tea lead."—The cleaned article is coated with muriate of zinc or with sal ammoniac and resin; it is then passed through a bath of molten " China or " tea lead " " after the manner of 'galvanizing.' " " A coating " of lead will thus be effected without a previous application of any " other metal, and this operation may be repeated as often as " desired; or a coating of ordinary pig or other lead may be added " by passing the article into a bath of the same, after the said " manner of galvanizing."

[Printed, 3*d.*]

A.D. 1857, March 16.—No 741.

BROOMAN, RICHARD ARCHIBALD (*a communication*).—(*Provisional Protection only.*) " Improvements in zincing or coating " metals with zinc, and in cleaning metals."

" This invention, as far as it relates to the zincing of iron, is " based upon the fact that iron possesses the property of precipi- " tating zinc from its solutions."

The following processes are set forth :—

1st. The cleaned iron is rubbed with an amalgam of zinc in powder. The amalgam should have been previously digested in hydrochloric acid with excess of ammoniacal salt ; chloride of zinc may be used instead of hydrochloric acid.

2nd. Instead of an amalgam of zinc, zinc in powder and a salt of mercury dissolved in hydrochloric acid is used.

3rd. " This solution is composed of zinc in powder, and of am- " moniacal salt in excess in chloride of zinc with excess of acid."

4th. " Chloride of zinc and amalgam."

5th. " The same solution heated, with the addition of ammoni- " acal salt," or chloride of zinc may be used in connection with a mercurial salt " and chloride of lime or potash."

The mercury may be dissipated by heat.

This invention also consists in the use of mercury and an ammoniacal salt in connection with the usual pickling bath for cleaning iron.

[Printed, 3*d*.]

A.D. 1857, March 18.—No 767.

JOHNSON, RICHARD.—(*Provisional Protection only*.) The title of this invention is " Improvements in cleaning iron and other " metals after the manner known as ' pickling.' "

The inventor states :—

" My invention refers to the preservation of iron and other " metals from injury during the process of cleaning, preparatory " to drawing, *coating with other metals*, or for other purposes ; and " the principle I proceed upon is to exclude the materials from " the access of atmospheric air during their treatment with the " acids or other substances used for effecting the required object.

" To this end I use an air-tight vessel to receive the articles to " be operated upon and the pickle solution, and from this vessel " I withdraw the air contained therein when thought desirable, or " I adopt other methods embodying the same principle of exclu- " sion of air from the metallic surfaces."

[Printed, 3d.]

A.D. 1857, March 31.—N° 887.

GOODE, SAMUEL JABEZ.—The title of this invention is, "An "improvement or improvements in depositing metallic alloys by "electricity."

In his Provisional Specification the inventor states:—"My "invention consists in using plates of the metals of which the "alloy is composed, instead of a plate of the alloy itself in the "solution from which the alloy is being deposited. For example, "when I wish to deposit brass, I suspend in the solution a plate "of copper and a plate of zinc, the said plates being connected "with the negative element of the battery. By immersing one "or more of the plates to a greater depth, or by bringing one "or other near to the surface on which the alloy is being depo-"sited, the composition and colour of the deposited alloy can be "regulated at pleasure. My invention is applicable to the depo-"sition of alloys in general by electricity, whether the alloy be "composed of two or more metals."

In the Complete Specification the description is exactly the same in substance as the above, but at greater length.

[Printed, 3*d*.]

A.D. 1857, April 25.—N° 1175.

BURROW, JAMES.—"Improvements in coating wrought iron."

In one electrolytic arrangement a wooden trough contains the galvanic series, the depositing solution—which is also the exciting liquid to the galvanic series—and the plates to be coated; the said plates to be coated rest upon the zinc or coating metal of the galvanic series. The galvanic arrangement is at the bottom of the trough, and is placed horizontally, so that the zinc or coating metal is uppermost. The iron plates are kept apart from each other in the trough by means of wooden pegs, and are disposed vertically. One termination of the galvanic series is dipped "into a vessel containing an acidulated solution;" the other is immersed "in a vessel containing hot water, or heated "sand bath, or an alkaline solution." The "straps" of the galvanic series are copper and zinc; the coating metal may be substituted for zinc.

In another electrolytic arrangement carbonized wood and zinc compose the galvanic series, and the iron plates rest upon the

carbon bars as well as upon the zinc plates. The carbon and zinc are besides electrically connected; the solution is used weak and at an elevated temperature.

By the above-described processes, successive coatings of tin, zinc, lead, and copper may be applied to wrought iron, either with the assistance of mercury or not.

The coating solutions consist principally of chlorides of the metals in combination with alkaline chlorides.

A method of preparing a glaze and applying it to wrought iron is set forth in detail.

[Printed, 4*d*.]

A.D. 1857, April 27.—N° 1180.

COWPER, CHARLES (*a communication from Hyppolite Landois and Léon Daniel, of Paris*).—"Improvements in electro-plating "and depositing metals."

"The bath or solution of silver or other metal to be deposited "is prepared by adding tartaric acid to a double cyanide of po- "tassium and the required metal, so as to precipitate a tartrate "or bitartrate of potash, leaving the metal in the solution, which "is then in a fit state to be employed for the electro-deposition "of the metel."

To make a gold bath, a solution containing certain proportions of chloride of gold and cyanide of potassium is placed in a stoppered glass vessel, and a sufficient quantity of tartaric acid is added thereto "to precipitate the potash of the cyanide in com- "bination with the tartaric acid. The vessel is immediately "closed air-tight by inserting the stopper, or the liquid is sub- "mitted to pressure in any other manner, so as to confine the "vapour of hydrocyanic acid, which would otherwise escape. "When the tartrate has precipitated and the reaction is complete, "the vessel is opened and the liquid is filtered; the tartate" [tartrate?] or bitartrate remains on the filter; "and the solution "which passes through the filter is then ready for use." This bath should be acid.

"A silver bath or solution is prepared in a similar manner, "substituting nitrate of silver for chloride of gold. The silver "solution should be neutral, or nearly so."

"*Solutions of* other metals are prepared in a similar manner."

These solutions "are capable of being employed for electro-"plating and depositing metals on a great variety of other "metals."

[Printed, 3*d*.]

A.D. 1857, May 6.—N° 1274.

BECKER, JOHANN PHILLIPPE.—"Improvements in the mode "of silvering animal, vegetable, and mineral objects."

"The invention consists in effecting the silvering of mineral, "animal, and vegetable objects by submitting them to certain "fluids," "so that by electro-chemical action the object is accom-"plished."

Fluid No. 1 consists of certain proportions of caustic lime, grape or milk sugar, and racemic acid, dissolved in distilled water. Instead of the racemic acid, "the same quantity of car-"bonic oxide of soda, or potassium, or gallic acid," may be used. "The whole is then filtered, excluded as much as possible from "the atmosphere, and bottled up closely until used. If there is "sufficient time, the acids above mentioned may be dispensed "with, as the caustic lime and the grape or milk sugar will be "ultimately dissolved by the distilled water."

Fluid No. 2 is prepared by dissolving certain proportions of nitrate of silver and liquid ammonia in distilled water.

"Metal to be silvered must first be cleaned with diluted nitric "acid, then rubbed with a mixture of cyanure" [cyanide?] "of "potassium and silver powder, washed with water, then dipped "alternately in liquors No. 1 and 2, until they appear sufficiently "silvered. Iron should first be immersed in blue vitriol."

Methods of silvering animal, vegetable, and mineral substances are also treated of in detail.

[Printed, 4*d*.]

A.D. 1857, June 1.—N° 1540.

WALENN, WILLIAM HENRY.—"Improvements in the elec-"tric deposition of metals and metallic alloys."

This invention consists of "the application of the tartrate of "ammonium and cyanide of potassium in combination, in a "solution used for the electric deposition of metals, or any modi-"fication of this combination, according to the metal or alloy "required to be deposited."

The proportions of the tartrate of ammonium and cyanide of potassium vary with each metal or alloy to be deposited. The proportions are stated for the metals copper, silver, and gold, and for the alloys bronze and brass. In the menstruum or solvent solution thus formed, "cyanides, tartrates, carbonates, or any "other suitable salt or salts" of the metal or metals to be deposited are dissolved; the resulting electro-depositing solution is then ready for use.

"The solution for depositing may also be made by the assist- "ance of a galvanic battery, or other sufficient source of electric "power, by mixing the cyanide of potassium and tartrate of "ammonium solutions in the desired proportions, and using a "large positive plate of the metal or alloy required to be depo- "sited, and a fine wire for a negative plate, to charge the solvent "solution above named, with the quantity of metal requisite to "give a reguline deposit."

"The tartrate of ammonium alluded to is the neutral tartrate."

"To deposit the alloy brass, a source of electric power should "be used, capable of evolving hydrogen freely at the negative "pole; this is a general rule to be observed with all alloys."

The solutions may be used either hot or cold.

[Printed, 4d.]

A.D. 1857, June 24.—N° 1766.

PARKES, ALEXANDER.—(*Provisional Protection only.*) This invention is entitled "Improvements in coating metals with other "metals."

The inventor states:—"This invention has for its object im- "provements in coating metals with other metals. For this "purpose zinc in a granulated or divided state, or other metal "positive to the metal to be coated, is added to the coating solu- "tion, which may be prepared as if it were to be used for depo- "siting metals with a galvanic battery in the ordinary way of "electro-deposition. The article to be coated is immersed and "moved about rapidly in the solution in contact with the zinc or "other metal until a coating of sufficient thickness is obtained. "This process is particularly applicable to coating small articles, "such as pins, nails, or screws, which cannot conveniently be "coated by the use of a battery."

[Printed, 3d.]

A.D. 1857, July 1.—N° 1835.

NEWTON, WILLIAM EDWARD (*a communication from Charles Nègre, of Paris*).—" Improved processes for ornamenting metallic " surfaces, and for producing surfaces in intaglio or in relief for " printing purposes."

The design for ornamenting metallic surfaces or printing from them is first produced upon them by means of " a reserve or insulating varnish;" all portions of the metallic surface which are bare are then covered with another metal by means of electro-deposition. If the design is merely intended as an ornament, the exposed surface of the underneath metal is oxidized or sulphurized, but if it is desired to print from, the design so formed is bitten into by suitable menstrua.

The design is obtained upon the metallic plate by the action of light. A sensitive layer of organic matter is made to receive the design by the ordinary photographic operations; those parts that have been protected from the action of light are then dissolved off by a suitable solvent, leaving bare the polished metallic surface underneath.

A reserve may also be obtained on " metal, marble, stone, &c.," by applying a proof from a " heliographic engraving " to the said surface.

To obtain an inlaid design.—" The metallic plate having been " etched, an inlaid design may be obtained by covering the parts " in relief with a reserve or ground, and immersing the plate as a " cathode in a solution of one of the soluble salts of the metal to " be obtained, which metal will be deposited, and will fill up the " sunken parts."

Other methods of obtaining ornamental and printing surfaces, in which the permanent deposition of one metal upon another is not concerned, are set forth at length.

[Printed, 5*d*.]

A.D. 1857, July 8.—N° 1901.

BAHN, LOUIS ALBERT.—(*Provisional Protection only.*) "Im-" provements in galvanizing metals, and in the apparatus em-" ployed therein."

" In carrying out this invention, after the metal to be galva-" nized has been passed through the ordinary acid baths, and

" been dried, it is immersed in the ordinary spelter bath, which " is kept in a state of gentle agitation by any convenient me- " chanical arrangement. In place of using sal-ammoniac on the " top of the bath, as at present employed in the galvanizing " process, I employ resinous and fatty matter, either combined or " separate, to cover the surface of the bath for the purpose of " preventing oxidation. By this means I am enabled to prevent " the formation of dross or muriate, and ammoniac of zinc, which " is generally precipitated to the bottom of the bath in the ordi- " nary modes of conducting the galvanizing process. In some " cases I propose to introduce the articles to be galvanized into the " spelter bath from the sides or bottom, in place of immersing " them from the surface, whereby I protect the spelter from the " action of the air, the bath being also closed by a lid or cover " which is luted so as to be perfectly air-tight. For the facility " of introducing wire or bars of metal into the bath from the " sides or bottom, I employ suitable stop-cocks fitted with funnel " mouths. On opening the cock the bar to be galvanized is " pushed through it, and the small quantity of moulten metal " which escapes into the funnel mouth is partially cooled by the " application of a wet rag or sponge, or other cooling agent to " the sides of the funnel mouth, so as to keep the metal in a " semi-fluid state, whereby the metal itself forms the barrier " against any further escape from the bath."

[Printed, 3*d*.]

A.D. 1857, July 30.—N° 2074.

COULSON, SAMUEL.—(*Provisional Protection only.*) " Im- " provements in preparing solutions for coating with aluminium."

" This invention has for its object improvements in preparing " solutions for coating with aluminium. For this purpose cyanide " is used, and the preparation is by preference produced as " follows:—Into a solution of cyanide of potassium in water is " introduced a plate or anode of aluminium, attached to the " positive pole of a galvanic battery, and a plate of copper or " other suitable anode" [cathode?] "is attached to the negative " pole of the battery, the solution of such latter pole being sepa- " rated by a diaphragm. By this means the aluminium will be " *dissolved, and* a proper solution thereby prepared, which is to

" be used in depositing by electric means, as like solutions of " silver and of gold are now deposited."

[Printed, 3*d.*]

A.D. 1857, August 19.—N° 2198.

WALL, ARTHUR.—" Improvements in coating metallic surfaces," principally applicable to the preservation of the bottoms of iron vessels from corrosion and from the adhesion of marine animals.

The coat which is comprised in the first improvement is composed of a certain paint containing oxide of lead next to the metallic surface, and an outer coating with a mercurial paint.

In the second improvement an acid solution of the sulphate of the metal be deposited is dissolved in a mixture of naptha and " pyrolignous spirit." The resulting solution may " be applied " to the metallic surfaces with a brush, such surface being pre- " viously cleansed from rust, scales, grease, or any other impurity " or foreign matter; or the solution may be placed in a tank and " the metal be immersed in it, and electric currents applied, if " required."

To clean the metallic surface, a mixture of muriatic acid and chalk is painted over the metal with a brush, and allowed " to " remain on the iron till dry, and till the coating assumes a red, " rusty appearance, say about 4 or 6 hours minimum to 10 or 12 " hours maximum." This coating is then removed with hot water and a brush.

When a sufficient metallic covering has been obtained, the surface is washed with hot water and then " with a weak solution of " potash, the whole wiped dry, and the solution, herein-before " described, for the purpose of preventing fouling in sea water " applied as a surface covering."

[Printed, 4*d.*]

A.D. 1857, December 19.—N° 3115.

NEWEY, THOMAS, CORBETT, JOHN, and PARKES, WILLIAM HENRY.—(*Provisional Protection only.*) " A new or improved " method of treating or coating steel pens and penholders, to " prevent the oxidation of the same, which method of treating or " coating may also be applied to other articles of iron and steel."

A plate of tin is suspended in a hot solution of bitartrate of

potash, "which tin is connected by a copper wire to the zinc" [copper?] "of a voltaic battery;" "the pens, penholders, and "other articles" are suspended "in the solution by copper "wires, which connect them with the copper or negative metal" [zinc or positive metal?] "of the battery; in a short time the "articles are coated with a coating of tin, which gives them a "silver-like appearance, and preserves them from oxidation. The "surface of the plate of tin suspended in the solution, must, in "the first instance, be greater than the surface of the pens or "other articles. By this means the solution will become well "saturated with tin, after which equal amounts of surface may "be employed. Instead of pure bitartrate of potash, red tartrate "of potash may be employed, or caustic potash may be employed, "either of which in solution may be used instead of the solution "first described."

[Printed, 3*d*.]

1858.

A.D. 1858, January 28.—N° 156.

JOHNSON, JOHN HENRY (*a communication from Charles Felix Sebille, of Nantes*).—This invention "relates to improve-"ments in the manufacture of lead and other soft metal piping," and consists in applying "a coating or lining of tin" to the interior, or to the exterior and interior, or to the exterior only, "of such piping during the process of its manufacture."

In the first machine, described in the Specification and shown in the Drawings, the pipe itself is produced by the action of the piston of a vertical press upon the molten metal within the cylinder of the said press, causing the metal to exude from a die in the form and size of the pipe required. An internal "mandril" is fixed to a cross head, which is contained inside the cylinder, and which bears against the under surface of the die or draw plate; "the middle portion of the mandril is made of smaller diameter "*than* the top and bottom of the same;" the upper portion of the *mandril is* expanded to the size of the internal diameter of the

finished pipe. When a short length of pipe has been pressed through the die, "a quantity of molten metal duly prepared with "the requisite resinous agents for the process of tinning is poured "into the pipe," and will probably rise some distance above the top of the mandril inside the pipe according to the quantity of tin required. As fast as the tube exudes from the die, it will be continuously coated with the tin which enters the annular space between the middle portion of the mandril and the interior of the pipe; the size of the upper portion of the mandril regulates the thickness of tin with which the pipe is coated. In coating large pipes the mandril "is made hollow, so as to form a cup, the "bottom of which is perforated laterally, so as to communicate "with the exterior of the mandril and the internal surface of the "pipe;" in coating small pipes, the mandril may be solid.

In another machine, for tinning the inside of pipes of large diameter, the mandril is secured at its lower extremity to the ram or piston of the press; the mandril therefore rises with the ram or piston, and, in consequence of the shape of its upper end, in its progress up the pipe, it tins the interior of the said pipe to the desired thickness. In this case, the upper end of the mandril is made hollow, as described for use with large pipes in the first machine.

In a third machine the lead pipe is coated, both inside and out, with tin. The arrangements for coating the pipe inside are the same as those described above. An outer brass cylinder is fitted on to the die outside the pipe, and external to the cylinder of the press, so as to enclose or surround the pipe at the part where it passes through the die; this cylinder "forms a receptacle for the "tin which is required for coating the outside of the pipe, the "internal and external coatings being effected simultaneously, "and as fast as the pipe is produced."

An arrangement, which may be employed or not in combination with the above-described machines, consists of a grooved pulley, over which the newly-made pipe passes to a bath of molten tin, thence to a revolving drum, upon which "it is wound as fast as it "is produced." In order that the pipe may be well immersed in the molten tin, it is caused to pass beneath a second grooved pulley, which maintains it at a proper depth beneath the surface. This arrangement may be used with the ordinary pipe press.

[Printed, 10*d*.]

A.D. 1858, February 23.—N° 353.

SHEPARD, EDWARD CLARENCE.—(*Provisional Protection only.*)
"The covering of metals by the alloys of other metals as well as "metals, by means of electricity."

1st. To deposit an alloy of silver and nickel.—The solution is made by adding carbonate of ammonia to a solution of nitrate of silver, until the resulting solution is perfectly clear, then making a similar solution of carbonate of nickel in carbonate of ammonia, and adding these two clear solutions together. The carbonate of nickel is, preferably, precipitated by carbonate of potash. An anode of one part of silver, and two parts of nickel, is used. "When working the solution constantly if it does not work "rapidly, put three or four ounces or more of cyanide of potassium into about fifty gallons of the solution."

2nd. "To give to iron, zinc, and other metals, the appearance "of bronze, brass, copper, &c."—A solution of cyanide of potassium is mixed with a solution of sulphate of copper, until the resulting solution is clear; a solution of cyanide of potassium is also added to a solution of sulphate of zinc, until a clear solution is produced; these two clear solutions are then mixed together, and certain proportions of caustic potash and "cream of tartare" are added thereto. "To make the color of the brass red you use a copper "anode or plate; to make the color green you use a brass anode; "when you want a rich color like gold thrown upon any metal, "the solution should be made warm or hot while working."

[Printed, 3*d.*]

A.D. 1858, February 27.—N° 390.

NURSE, DAVID, NURSE, ROBERT, and NURSE, GEORGE.—"Improvements in coating metals, and in the apparatus connected "therewith."

These "improvements refer mainly to coating iron and other "metals with tin or with an alloy of tin and lead by using a "suitable hot chamber in substitution of the employment of "grease or grease pots in the finishing process; and the same is "wholly or in part applicable in the process of zincing or galvanizing of metals."

The hot chamber consists of "a cast iron or other chamber, "*constructed so* as to be set in brickwork and heated by means

" of a furnace;" this chamber is divided, by partitions, into a number of cells, each of which is closed at top by means of a separate moveable cover.

After being coated in the ordinary way by immersion in the bath of molten metal, the plates are placed in the hot cellular chamber "until the superfluous metal coating, which is thus kept " melted, runs off."

By this means grease is only used in the "process preparatory " to dipping the plates into the molten metal bath; or, instead of " using grease in the said process preparatory to dipping for " coating the plates," the uncoated plates may be laid "in a " strong saline solution, made of chloride of zinc dissolved in " water when manufacturing terne plates, and of chloride of tin " for tin plates, and afterwards dipped successively in two baths " of molten metal, one technically called the 'tin pot,' the other the " 'wash pot;'" the plates are then finished "by the simple " transfer of each plate, as dipped, to its separate cell" in the said hot chamber.

[Printed, 5*d*.]

A.D. 1858, March 29.—N° 667.

JACQUIN, EDMOND AUGUSTE (*a communication from Monsieur Henry Garnier, of Paris*).—This invention is entitled "An improve- " ment in preparing plates for printing," and it relates to "cover- " ing the printing surfaces, whether intaglio or relief, and whether " of copper or other soft metal, with a very thin and uniform " coating of iron by means of electro-metallurgical processes."

The electro-depositing solution consists of a solution of sal ammoniac, in which the quantity of iron requisite to produce a reguline deposit, is dissolved by means of electric force.

In carrying out this invention, an electric intensity of five of Bunsen's cells, arranged in series, is used by preference. Immediately on immersing the copper plate, as a cathode, in the solution, it should be covered with a bright coating of iron all over; the " copper plate should not be allowed to remain in the bath and " attached to the negative pole of the battery after the bright " coating of iron begins to show a blackish appearance at the " edges. Immediately on taking a copper plate from the bath," it is washed by means of jets of water, dried, and washed with spirits of turpentine; the plate is then ready for printing from.

Before the coating of iron is entirely worn away, it may be removed by acids, and the printing surface may then be re-covered with an iron coating as often as may be required. Dilute nitric acid is used to remove iron from copper.

By means of this invention, printing surfaces are said to yield a large number of impressions.

[Printed, 4*d*.]

A.D. 1858, May 17.—N° 1100.

HILER, SELAH.—(*Provisional Protection only.*) The title of this invention is "An improved method of coating or amalgamating iron with silver, copper, brass, or other metals, or alloys of metals."

The inventor states:—"The nature of my said invention consists in forming a surface of brass or other ornamental metal on iron or steel as follows:—"

"I take a suitable sheet, bar, or block of wrought iron, (or steel), and clean the surface thereof on one or more sides and heat the same, and while heated cast on to said surface or surfaces the brass or other metal, and the union may be accelerated by the use of borax or other flux, or the coating metal may be united to the iron while the latter is in a state of fusion, and the brass or other metal is to bear the desired proportionate thickness to that of the iron.

"The iron and brass, or other plating metals may then be rolled down to the desired shape or thickness, or cut out, or made up into any articles for which said plated or coated iron may be adapted, such as buttons, stair rods, tubing, bells, hinges, bolts, and other articles."

[Printed, 3*d*.]

A.D. 1858, June 8.—N° 1289.

BROOMAN, RICHARD ARCHIBALD (*a communication from Messieurs Liébaut and Egrot*).—(*Provisional Protection only.*) This invention is entitled "Improvements in the manufacture of copper pipes and tubes."

"This invention consists in manufacturing copper tubes and pipes without joint or weld, and either straight or curved, by depositing copper in" [by means of?] "a galvanic battery over "*and upon* a core of lead, or other fusible metal or material

" capable of being fused or melted by heat, or otherwise reduced " and removed. The core may be solid or hollow, *and when " hollow may be allowed to remain in the copper tube*, or may " be removed by melting, or otherwise."

[Printed, 3*d*.]

A.D. 1858, July 17.—N° 1613.

SPENCE, JAMES.—" An improvement in the manufacture of tin " plates and terne or leaded plates."

According to this invention, " puddled steel " is employed in the manufacture of the above-mentioned plates ; plates so manufactured " are superior in appearance, more durable, and capable " of being made at will soft and pliable, or hard and rigid, and " also more or less elastic, to suit the several purposes for which " they are to be used."

The " black " plates to be tinned are made as follows :—The plates are rolled from a " finished bar," made from piling and rolling, in the usual way, a number of puddled steel bars in the first stage of manufacture. In the piling of these bars, those of the softest steel are placed in the middle of the pile ; the outsides of the pile being highly carbonized will endure the reduction of carbon upon heating, " and a medium proportion of carbon will " remain in the whole." In rolling the bar into sheets a uniform heat is imparted to them by a second furnace ; thus a hard quality of steel may be rolled into plates and made available for the purposes required.

The " black " plates are then pickled—rather longer than is usual with iron plates—annealed, and tinned with ten per cent. less tin than when charcoal iron is used.

To render the plates elastic they are suddenly—whilst hot—passed into a refrigerator ; the edges may be rendered soft by dipping them into a shallow bath of molten tin.

[Printed, 3*d*.]

A.D. 1858, October 28.—N° 2409.

MUNRO, WILLIAM.—The title of this invention is " A new " manufacture of capsules and other metallic articles," and it relates to tinning sheets of lead by means of an electro-tinning solution, the said sheets of lead being afterwards made into capsules or other articles.

The electro-depositing solution consists of sulphate of tin prepared as follows :—Certain proportions of solutions of muriate of tin and common soda are mixed, thus producing a precipitate of carbonate of tin ; a certain quantity of sulphuric acid is then added to the precipitate when it is in a state of suspension in water.

The tinned lead, as taken from the solution, may be rolled into thin sheets, and capsules, &c., made therefrom ; or "capsules or "other articles previously made of lead may be coated with tin "by putting such capsules or other articles on the zinc wire" [of the galvanic arrangement?] "instead of the plate of lead."

[Printed, 3*d*.]

A.D. 1858, December 16.—N° 2890.

BROOMAN, RICHARD ARCHIBALD (*a communication from Messieurs de Sauvigny, of Paris*).—"An improvement in plating "and gilding forks, spoons, and other metal articles."

"According to the method usually followed in electro-plating "and gilding, a uniform coating is laid on every portion of the "article, silvered or gilt. Now, in many articles which are "subjected to more wear at some parts than at others, as, for "instance, the prongs of forks, the bowls of spoons, &c., it is "desirable to obtain a thicker coating at those parts. In order "to effect this object I take any article, after having been uni-"formly coated by the aid of the galvanic bath, then heat it, and "by affinity of metal for metal solder on to those parts requiring "a thicker coating as many layers of leaf silver or gold as may "be necessary to produce the thickness desired. When a spoon, "fork, or other article is partially worn, without ungilding or "unsilvering the whole article, those parts only where the defects "exist need be covered. To cover an article which has been "previously coated by the ordinary galvanic bath in parts it is "heated to about 500° centigrade (932° Fahrenheit), silver or "gold leaf is then placed on the parts to be covered. The spoon, "fork, or other article can be burnished with a brush, feather, "agate, or other usual burnishing tool."

[Printed, 3*d*.]

1859.

A.D. 1859, January 12.—N° 103.

BESLAY, CHARLES.—"Improvements in coating or covering "iron and steel with tin, zinc, or lead, or alloys of those metals "by electrical deposit."

The electro-depositing solutions used are composed of caustic soda or potash, together with the oxide of the metal to be deposited; these solutions do not engender "any tendency to oxidize "in the metal coated, therefore the coating and the metal coated "have permanent adhesion together."

"The alkaline bath I form in somewhat of the following pro- "portions by weight, from five to six parts of metal, fifty to "sixty parts of caustic potash, and one thousand parts of water. "In order to utilize waste scraps of tin plate or other tinned or "zinced iron, I introduce these scraps into the alkaline bath, "placing them in a mass to form one pole of the battery, the tin "or zinc of which are thereby decomposed and transferred to the "object to be coated, as well understood. Instead of the waste "scraps, lead, tin, zinc, or alloys of those metals may be used "and decomposed in the alkaline baths, and the same applied to "the coating of steel and iron. In operating with tin, and in "order to obtain the primary quality of the metal in solution in "the bath, I boil the metal or its oxide in a solution of caustic "potash."

[Printed, 3*d*.]

A.D. 1859, February 25.—N° 511.

HINDE, THOMAS CALLENDER, and HINDE, GEORGE JAMES.—"Improvements in coating iron with copper or alloys of copper."

According to this invention the iron is first tinned or galvanized, then coated with copper by immersion in the molten metal, and, finally, annealed, and (if necessary) smoothed.

Instead of being tinned or galvanized, the iron may be coated with lead, or an alloy of lead, or with alloys of tin and zinc, by immersion in the molten metal or alloy.

The articles may be annealed in a covered pan of charcoal. Another method of annealing consists in immersing the coated

article into heated charcoal. A third method consists in immersing the article in a molten vitreous mixture, and allowing it to cool gradually.

To give iron bars, plates, &c. a smooth surface, they are rolled, and (if required) softened by annealing.

To coat iron wire, it is immersed in the molten copper, or alloy of copper, annealed, drawn, annealed, and so on, until it is of the requisite diameter. When the wire is immersed in the molten copper or alloy, a steel bar, passing across the crucible, obliges the said wire to go beneath the fused metal.

If a portion of a piece of iron is to be left uncoated, that portion is not freed from oxide; the fused metal does not adhere to the uncleaned part.

[Printed, 4*d*.]

A.D. 1859, April 4.—N° 846.

MOREWOOD, EDMUND.—"Improvements in coating metals" by immersion in molten metals or alloys.

1st. "The coating of sheets or other suitable surfaces of iron or "copper" by causing them to pass between rollers, the jaws or openings between which are "immersed to a considerable depth "below the surface of the molten metal."

2nd. The use of "a bar or barrier stretching across or nearly "across the pot, and descending to the depth of an inch or "two into the molten metal (so shaped as to form an enclosed "space on the side of the pot at which the sheets or pieces of "metal enter,) to cause such sheets or pieces of metal to pass in "on the one side through one flux or kind of matter, and to pass "out on the other, either through no flux at all, or through some "other matter than that through which they entered."

3rd. Cleaning the coated metal.—Bran or sawdust may be rubbed on to the surface. Sometimes the coated metal may be immersed in boiling water, then in cold water, and dried. An additional coating may be deposited upon the article by means of "a solution of lead or tin."

In the Specification and Drawings an arrangement is described and shown, in which there are two pairs of rollers in the molten metal—two front rollers and two back rollers. The sheets are guided from the "flux box" or "barrier" above mentioned to *their path through* the metal and between the rollers by a "front,"

"middle," and "back" guide, thence to a pair of delivering rollers "outside the melted metal on the exit side of the bath."

By means of the 2nd improvement "waste flux" may be used on the entrance side of the pot, and sand, "whitening," or loam on the exit side.

[Printed, 7*d.*]

A.D. 1859, April 13.—N° 933.

HUGHES, JOHN, WILLIAMS, WILLIAM, and LEYSHON, GEORGE.—"Improvements in the manufacture of tin and terne "plates."

The usual method of manufacture of the above-mentioned articles is as follows:—The cleaned plates are immersed in a pot containing hot grease, they are then transferred to a pot containing molten tin or terne metal "(known as the tinman's pot,) and "are there allowed to soak for some time." The plates are then brushed over with tin in the "washman's pot," and deposited in a rack in another grease pot, where they remain for some time, to allow the excess of metal to drain off. Lastly, the plates are placed in another rack to cool, and into a shallow bath of hot metal, in order to melt off the metal accumulated at their bottom edges.

According to this invention, instead of using the second grease pot, the plates are placed "in a rack contained in another pot of "hot metal;" when the rack is full it is raised slowly out of the pot; the superfluous metal is thus allowed to run off, "and when "the plates have cooled, which they are allowed to do in the "rack, they are finished."

Certain machinery is described and shown for performing this invention. The rack is raised out of the finishing pot by means of chains and chain wheels on an axis rotated by hand; the said rack is counterbalanced. The axis is capable of sliding horizontally in its bearings, "and it is caused to do so" when the rack has been raised out of the finishing pot; the rack is thus left to cool out of the way of the pot.

[Printed, 1*s.* 4*d.*]

A.D. 1859, April 18.—N° 982.

PARSONS, WILLIAM.—"Improvements in preparing sheet iron "and other metal sheets for japanners and other uses."

These "improvements consist in tinning each of the edges of a "plate or sheet, and then varnishing or coating the central por- "tion of each sheet or plate with a suitable varnish or matter to "prevent oxidation, by which on the one hand the sheets or "plates will readily admit of being soldered at the edges, and at "the same time much tin will be saved in the manufacture of "japanned articles where tin plate has heretofore been used. "The best mode of tinning or coating the edges of plates is to "employ shallow baths with a depth of melted tin, or tin and "lead, or other metal, according to the quantity of the edges it is "desired to coat; the process of coating with fused metal in "other respects is to be conducted as heretofore practised. When "the plates have been thus tinned or coated at their edges, they "are covered with varnish or such like matter, preferring to "employ a varnish composedof one pound of asphaltum dissolved "in two gallons of coal-tar naptha. This varnish is best applied "by immersing the plates in a bath containing the varnish, so as "to cover not only the centre of the plates, but also the tinned or "coated edges, as the varnish will not interfere with the soldering "the plates together; the varnish may, however, be applied with "a brush to the centre portions only of the plates."

[Printed, 3*d.*]

A.D. 1859, May 20.—N° 1250.

BUDD, JAMES PALMER.—"Improvements in the manufacture "of tin and terne plates."

The inventor states that it has been proposed "in the Pro- "visional Specification of a previous Patent" in which he is interested, "to place the plates next after they have passed through "the washman's pot, into a rack in a pot of the melted metal, "and when such rack is full of plates to raise the rack, and also "the plates, slowly out of the melted metal."

According to the improvements which form the present inven- tion, independent apparatus is used to "lift the several plates "simultaneously out of the metal and out of the rack, which is "allowed to remain." For this purpose, a frame, carrying a suitable number of clips, is made to clasp the requisite number of plates, each clip holding one plate. The frame is lowered, then *slowly risen; the* plates are then deposited in a receiver, and *cleaned in the* usual way by bran.

The frame is raised and lowered by means of a screw and screw wheel.

A wooden rake is used to keep the plates separate from each other until they have cooled.

If it be desired to do away entirely with the use of oil as a covering to the metal in the wash pot which is used instead of a grease pot, a clip is used which can be immersed entirely in the metal. By this arrangement the oxide can be entirely skimmed off immediately before the frame carrying the plates is raised. Another method consists in covering the frame with a bonnet which can be immersed under the surface of the metal; this arrangement obviates the necessity of skimming.

[Printed, 1*s.* 1*d.*]

A.D. 1859, May 23.—N° 1262.

LEACH, ROBERT VALENTINE, and WILLETT, THOMAS WILLIAM.—"Improvements in the manufacture of tin plates and terne "or leaden plates, and in the apparatus connected therewith."

The object of this invention "is to obtain a more uniform weight "of coating upon every plate, and also more evenly to distribute "that weight of coating over its entire surface," than is done by the present method of manufacturing these articles.

After coating the iron plates in the tin or terne pot and brushing them, they are placed in a rack, immersed in the wash pot at a given speed, allowed to remain there for a brief interval, then raised therefrom at a determined speed. "The plates thus coated "are then in the same or a similar rack, and by similar mechanical "means, simultaneously dipped in the grease pot." "The rack "enters the grease pot at a gradually increasing speed, and leaves "it at a gradually decreasing speed;" by this means the coating is uniformly distributed over the surface of each plate.

Water power is the motive power used to raise and lower the racks.

The machinery used to raise and lower the racks "is a simple "lever, to one extremity of which the rack is suspended by "chains, while the other extremity is acted upon by a cam of "suitable form."

Another arrangement by which an equal distribution of the coating upon each plate is obtained is by placing the plates hori-

zontally in a suitable rack, and imparting rotary motion to this rack when it is immersed in the grease pot; thus the centrifugal force throws off the superfluous coating.

For the commoner kinds of tin and terne plates, the weight of the coating metal upon each plate is determined by means either of an ordinary grease pot or of one similar to that herein-before first described; the plates are then arranged "in a suitable rack in a "position nearly horizontal," and immersed again into a grease pot where they are allowed to remain for a certain time; the coating upon the surfaces is thus equalized.

A new apparatus for listing consists of a flat tinned copper plate "placed at an inclination of about thirty degrees" [to the horizon?] and heated by a suitable flue. "The plates are arranged "in a suitable rack, and the edge that is to be listed rests upon "the tinned copper. The effect is to heat the edge of the plate, "and remove the superfluous portion of coating metal, which then "runs from the inclined surface of the plate."

[Printed, 4*d*.]

A.D. 1859, June 21.—N° 1488.

TOMKINS, GEORGE.—(*Provisional Protection only*.) "Improve-"ments in coating metals, and in the apparatus connected there-"with."

This invention relates to the coating of iron plates with tin, or an alloy of tin and lead, by a method in which the use of grease pots is dispensed with.

The melting pots are arranged in close proximity to each other; the first holds "liquid resin," the second molten tin, and the third the "wash." Over the pots are clips or hooks, connected with a lever, by which means a number of plates are immersed at the same time; both ends of the lever may be made available for this purpose, and the pots are arranged so that when one set of plates are raised out of the resin pot (for instance) on one side, another set of plates enter the resin pot on the opposite side. By moving the column or support on which the lever rests, a similar operation may be performed with the other pots.

On leaving the tin pot the plates pass simultaneously through a brush, "in the form of a double gridiron;" all superfluous metal is, by this means, left in the pot.

"To prevent any metal adhering to the bottoms of the "plates on leaving the 'wash-pot,' a hot plate polished is "placed in juxtaposition with the 'wash-pot,' having a small "roller at its extremity, with a canal below, so that as the plates "are drawn across the hot plate over the roller, the superfluous "metal will return to the pot, thus entirely dispensing with the "grease pot."

The above-described apparatus is also applicable to zincing metal plates."

[Printed, 8d.]

A.D. 1859, October 3.—N° 2235.

MOREWOOD, EDMUND.—"Improvements in coating metals" with other metals by immersion into molten metal.

"Sheets, plates, or pieces of coated or uncoated iron or copper" are passed, in a wet state, between a pair of "receiving" rollers to the "flux box" of the bath of molten metal: thence, by means of a "front" guide to a "front" pair of rollers, which are wholly immersed in the bath: the plate is then caused to pass horizontally through the molten metal (by means of a "middle" guide) to a "back" pair of rollers; and brought out of the bath vertically by means of a "back" guide. The plates then enter a pair of "delivering" rollers, and are received by a workman.

To free the sheets, &c., as far as possible from adhering flux, they are immersed a second time into melted lead or tin, the said melted lead or tin having (preferably) no flux on its surface.

The "receiving" rollers of the above-described bath may be so arranged as to confine the vapour of the flux, and to prevent injury to the workman from the immersion of the wet plate, &c.

For small-sized plates, an "intermediate" pair of rollers may be fixed between the "back" rollers and the "delivering" rollers, just outside the surface of the melted metal.

The sheet or plate may receive a polished surface after leaving the "delivering" rollers, by passing it between "a pair of chilled "or case-hardened rollers hollow and either heated by steam "or not."

N° 846 (A.D. 1859) is referred to.

[Printed, 8d.]

A.D. 1859, October 5.—N° 2253.

WHYTOCK, ANDREW.—(*Provisional Protection only.*) The title of this invention is "A mode or method of applying joined "sheets of metal for roofing and other purposes."

The inventor states:— "My invention consists in putting sheets "of iron or other metals together in any lengths by means of "folding, or what is known in the tinplate worker's trade as "grooving, or by means of rivetting or linking, or otherwise con- "necting the sheets, in order that they may be laid on roofs or "sides of buildings in any required length, *or for the purpose of "being continuously coated in any required lengths with other "metal, or compounds of other metals,* or with paint or tar, or "other substances used to protect metal surfaces from corrosion "or decay, or other purposes."

[Printed, 3*d.*]

A.D. 1859, October 11.—N° 2313.

WHYTOCK, ANDREW.—"Improvements in coating sheets of "metal with other metals and other substances."

These "improvements consist in combining sheets of iron or of "other metal together at their edges," "by grooving, linking, "rivetting, or otherwise," before coating them with other metals, or other substances.

In order to dry and heat the said connected sheets, before they enter the bath of metal or material, they are progressively "moved "through an oven or heated chamber, so as to come up to and "enter the bath at any desired temperature." "The first end of "a series of connected sheets is caused to descend into a bath "and under a roller or bar, or otherwise immersed below the "melted metal or material in the bath, and near the side of the "bath where the first end enters, then under another bar or "roller (also below the melted material) near the exit side or end "of the bath, or otherwise kept immersed, then up out of the "bath by the aid of the wires, strips, or chains, or other con- "necting pieces of metal, the other ends of which are attached to a "drum or other receiver. The other parts of the series of sheets are "wound around another drum or holder, and the connected series "of sheets is wound off one holder on to the other, the surfaces

" of the connected sheets becoming coated as the series progres-
" sively passes through the bath."

The "connecting of the sheets together may be only tem-
" porary." The connections of the edges of the succeeding
" sheets may be accomplished by screw or other clamps or
" fasteners, which may be blacked or coated over in such manner
" as to prevent the melted metal adhering thereto, which clamps
" or fasteners are to be removed after the sheets have come out of
" the bath and the sheets have cooled."

[Printed, *4d.*]

A.D. 1859, November 5.—N° 2523.

CUCHE, EMILE ALEXANDRE.—(*Provisional Protection only.*) "Improvements in galvanizing metallic wires."

The usual method of coating metallic wires with zinc is to unroll the cleaned wire from a bobbin, making it to traverse a bath of molten zinc. "At the exit from this bath the wire passes
" in a draw or guage plate or in sand, so as to disengage itself
" from the oxide of zinc and particles of pulverized charcoal
" which it meets at the surface of the bath."

According to this invention the guage plate or sand is replaced by "an apparatus, analogous to an argand gas burner disposed
" in such manner that the wire can be introduced and passed in
" the space which exists in the centre of the burner-like apparatus;
" jets of warm or cold air are forced out of the jet openings by
" means of a blowing machine or pump."

If it is desired that the grain of the zinc "form a helix round
" the wire," a tube of a certain diameter is adapted "to the centre
" of the jet apparatus in question," "in the interior of which is
" a helical hollow in which the current of hot or cold air circulates
" intended to envelope the wire in its passage in the centre of this
" tube."

The air may be replaced "by substances in a liquid or gazeous
" state, or it" [they ?] "may be pulverized and heated to a variable
" temperature, even to a state of incandescence, always having the
" object in view to augment the adhesion of the zinc in the
" galvanization of metallic wires."

"To efface the furrows in the zinc" a rotating draw plate or a combination of pullies may embrace the wire.

"A silicate of lead and a coating of black lead" may be applied to the surface of the crucible or vessel containing the molten zinc, to prevent the fused metal from attacking the said crucible or containing vessel.

[Printed, 3*d*.]

A.D. 1859, November 15.—N° 2595.

GRAHAM, JAMES.—The title of this invention is "Improve-
" ments in treating and applying products obtained when gal-
" vanizing iron."

" This invention consists partly in employing a solution of
" chloride of ammonium, chloride of zinc, and a little chloride of
" iron, for preparing iron and iron wire for galvanizing, instead
" of employing muriatic acid as is usual.

" This solution I obtain from galvanizing refuse called by some
" sal amoniac skimmings or sal amoniac dross, which is now
" considered refuse and of little value, and in many instances was
" thrown away. I prepare the solution by crushing the sal
" amoniac dross or skimmings, and by boiling the same until all
" or nearly all the soluble salts are dissolved. I then place the
" refuse in a reverberatory furnace and obtain a very good oxyd
" of zinc."

The solution made as above set forth is concentrated by boiling, and used in a boiling state. "The finest wire may be galvanized
" without injury by the action of acids."

[Printed, 3*d*.]

A.D. 1859, December 6.—N° 2764.

POTTS, FERDINAND.—" Improvements in the mode of manu-
" facturing or finishing tubes for certain purposes."

This invention relates to the coating of tubes with copper, brass or zinc. The coating may be applied to brass tubes or to iron tubes. The tubes are intended to be used in locomotive, marine, or other tubular boilers; also for condensers, " and other parts in
" and about locomotive and marine engines."

The processes employed are as follows:—Locomotive tubes of
" Muntz's metal" or brass are electro-coppered, and then drawn
" through a smooth steel finishing hole of the proper size in the
" same way and by the same appliances in which such tubes may
" have been originally made or formed." Iron tubes may be used as locomotive tubes by cleaning them and electro-coating

them with copper, as described above. When iron tubes are to be used for condensers, they are cleaned, drawn through "a hole "sufficiently small as to compress the entire outer surface of the "tube concentrically with the steel surface of the hole, thereby "producing a uniform smooth surface," and electro-coated with copper or other suitable metal; they are then again drawn "through a hole."

[Printed, 3*d.*]

1860.

A.D. 1860, January 30.—N° 236.

NURSE, GEORGE.—(*Provisional Protection only.*) "Improve-"ments in the manufacture of tin or 'terne,' and galvanized "metal plates."

"This invention relates to that part of the operation of pre-"paring metal plates necessary for removing the oxide from the "metal previous to its being coated or covered with tin or other "amalgam commonly used in the manufacture of tin or 'terne' "plates, and also galvanized iron plates."

"I take a number of sheets of metal of similar size, and the "surface of the first plate I sprinkle or cover all over with "powdered charcoal or carbon; upon this I place another plate, "and proceed to cover the surface of this second plate with "charcoal or carbon as before, and in this manner I continue to "pile several plates one upon the other, interposing a stratum of "charcoal powder or carbon between each until I have piled "together as many plates as I wish to operate upon at one time; "I then place these several plates in an annealing furnace, and "subject them to heat, by which the oxide will be removed "therefrom. The plates are then passed between rollers to "planish them in the usual way, and as the metal by this "becomes crystallized, the plates are again subjected to the "annealing process, and are then washed with a weak solution of "sulphuric acid and water previous to subjecting them to the "tinning or galvanizing operations, which may be performed in "the usual manner."

[Printed, 3*d.*]

A.D. 1860, March 10.—N° 653.

MORRIS, TIMOTHY.—"Improvements in voltaic batteries, and " in vats used in depositing metals by electricity."

"In constructing simple acid batteries according to my inven- " tion I proceed as follows:—I place a closed reservoir containing " the exciting acid at a lower level than that of the battery. A " siphon from the top of the reservoir communicates with the " top of the liquid in the battery, and a pipe from the bottom of " the battery communicates with the bottom of the reservoir. " As soon as the acid in the battery becomes charged with zinc, " it passes, by virtue of its greater density, into the reservoir, " and an equal volume of acid passes from the reservoir to the " battery. A circulation is thus set up, which continues as long " as the battery is in action, and any unsaturated liquid remains " in the reservoir. Where the exciting liquid of the battery is a " dense solution which becomes specifically lighter by the action " of the battery, as when a solution of sulphate of copper is " employed, I place the reservoir containing the solution at a " higher level than that of the battery, and connect the bottom " of the reservoir with the bottom of the battery solution, and " and the top of the reservoir with the top of the battery solution. " In sustaining or constant batteries where two liquids are " employed, both the arrangements described may be employed, " one to exchange one of the liquids, and the other to exchange " the other liquid."

"In constructing a depositing vat according to my invention, " the reservoir is placed lower than the vat and filled with the " depositing liquid of a proper working strength, and the pipes " connecting the reservoir with the vat are arranged as herein " first described. The heavy liquid as it is formed descends into " the reservoir, and liquid of the proper strength passes therefrom " to the vat."

"Where the solution in the depositing vat becomes specifically " lighter during use," the reservoir containing the solution is placed at a higher level than the depositing vat.

Instead of filling the reservoir with a solution of the salt employed, crystals of the salt may be used; the saturation of the liquid is thus kept up.

[Printed, 7*d*.]

A.D. 1860, March 22.—N° 748.

PEPPÉ, GEORGE TOSCO.—"Improvements in the manufacture "of thin sheet lead coated with tin."

"The thin sheets of lead herein referred to are obtained by "cutting from the outer surface of a mass or cylinder of lead, "and I propose to utilise the fresh unoxidized surface of the thin "sheet lead so obtained, to deposit thereon a continuous, un-"broken, and adherent coating of metallic tin, by means of the "electro-plating process."

"I take the thin sheet lead as it comes in a continuous sheet "from the cutting machine and conduct it into a trough con-"taining, by preference, stannate of soda, but other solutions "may be used, such as the stannate of potash, or a solution of "cyanide of potassium and tin. These solutions are maintained "at a temperature varying from 150° to 170° of Fahrenheit."

"The thin sheet lead is conducted along the bottom of the "trough on a series of wooden rollers revolving freely on axes "within the trough." A tin anode, suspended horizontally over the sheet lead, is preferred to be used with this solution.

After passing through the solution, as above described, the sheet lead may be cut "into pieces of a convenient size," which pieces may be electro-tinned with a further coating of tin.

The lead may then be drawn out to the thinness required by means of "laminating rollers," and then again put into the depositing trough to receive a fresh coating of tin.

[Printed, 3d.]

A.D. 1860, March 31.—N° 831.

SHERIDAN, JOHN.—"Improvements in the manufacture of "sheet metal casks and other vessels."

These "improvements consist in making up casks and other "vessels of sheet iron or other metal not coated with other metal, "and then when the heads at both ends, or the head at one end "of the casks or other vessels, as well as any hoops which may "be used around such casks or vessels, have been put into their "places, and fixed by the ordinary means, the casks or other "vessels are immersed into a bath of melted zinc, or tin, or lead, "or proper alloy, and thereby coated over the surface, and at the "same time the heads and hoops, and handles, and necks are

" fixed, and good joints are made where the edges of the sheet " iron or other metal come together, the metal casks or vessels so " completely or partly made being in a proper and clean state " when introduced into the melted zinc, tin, lead, or alloy of " metal."

The cask, made as described above, is cleansed and immersed in the bath of molten metal. The head or heads or body of the cask may have apertures to facilitate the outpouring of the molten metal after the cask has been immersed therein. One submersion only is required.

[Printed, 3*d*.]

A.D. 1860, April 3.—N° 851.

WOODRUFF, PHILIP.—(*Provisional Protection only.*) "An " improvement in the manufacture of iron from the puddling " furnace for the purpose of rolling same into sheets, intended to " be coated with tin, lead or any other metal, applicable also to " the manufacture of all other sorts of sheet or bar iron where " toughness, strength, and ductility are essential."

The object of this invention is to manufacture malleable iron of great toughness, strength, and ductility, and free from sulphur, phosphorus, and other impurities, by means of peroxide of manganese as a flux.

" For the purposes of this invention, I take an ordinary puddling " furnace and charge it, as usual, with four hundredweight to five " hundredweight (more or less) of pig iron or metal, and when " the iron is hot and well melted, I put in the flux of peroxide of " manganese, using from one to three pounds for each charge, " the quantity to be dependent upon the nature of pig iron used, " and the quality of the iron required."

" It will be found by the above mixture of manganese, with " ordinary care and attention, uniformity of product will be " obtained, and in making tinned plates the bar iron will roll " with great softness, and at a low degree of heat, fineness of " surface, and with little mill waste, will open without trouble, " and will produce but few 'wasters,' all essential points in tin " plate manufacturing, whilst the sheets when finished are " superior in appearance and toughness to any hitherto made."

[Printed, 8*d*.]

A.D. 1860, June 6.—N° 1385.

HUGHES, EDWARD THOMAS (*a communication from Joseph Corduan, of New York*).—"Improvements in coating or plating "the faces of printing type and stereotype plates."

"In subjecting types to the operation of being electrotyped or "plated with brass, I plate masses of them together in a suitable "frame, or fasten them together in bundles by wires; the letter "faces should all be upon the same plane, *i.e.*, with a perfectly "even surface; the faces are only to be immersed in the solu- "tion." The articles are cleaned by being brushed in a solution of cyanide of potassium.

The following solutions are used to electro-coat type:—

Brass solution.—A solution of black oxide of copper in cyanide of potassium is added to a solution of oxide of zinc in cyanide of potassium, the resulting solution is used with a brass anode, and "electro-magnetic" [magneto-electric?] force. It is preferred to use a brass vat, and to employ it as an anode.

Solution to deposit an alloy of copper, zinc, and iron.—Prussiate of iron, oxide of zinc, and black oxide of copper, are stirred in a boiling solution of cyanide of potassium until they dissolve. This solution is used cold.

Solution to deposit "key-metal."—A certain proportion of black oxide of copper and chloride of tin are stirred in a hot saturated solution of cyanide of potassium. This solution is allowed to cool before using.

Solution to deposit an alloy of tin and zinc.—Chloride of tin and oxide of zinc are stirred in a hot saturated solution of cyanide of potassium. The solution is allowed to cool, and is then ready for use.

[Printed, 4*d*.]

A.D. 1860, June 6.—N° 1393.

SAUNDERS, JOHN, and PIPER, JOSEPH.—"Improvements in "the manufacture of tin and terne plates."

"According to our invention we take the plates out of the "washman's pot, and instead of brushing them and finishing "them off in the mode heretofore in use, we remove the surplus "metal by passing them through rollers fixed near the side of the "washman's pot, or in a hot-air chamber, or partially or wholly

" submerged in hot grease or oil or other fatty matter, or in any " kind of flux (the rollers being turned by hand or power), after " which they are put in a rack, and when cool are finished."

[Printed, 3*d*.]

A.D. 1860, June 22.—N° 1523.

GRATTAN, NICHOLAS.—(*Provisional Protection only.*) This invention is entitled " Improvements in gilding steel and other " metals."

The inventor states:—" For this purpose I employ a solution of " sulphocyanide of gold prepared by adding sulphuric acid to a " solution of cyanide of gold in cyanide of potassium, and I " employ this solution by immersing in the solution the steel or " other metal article to be gilded, and attaching to it by a wire " a small piece of zinc, also immersed in the liquid; a galvanic " action is thus established in the liquid itself, the metal article " being the positive pole, and the zinc the negative. During this " action a coating of gold is deposited on the steel or other article, " which adheres so firmly thereto, even should the article be of " steel, that it cannot be removed except by absolute abrasion. " By no process heretofore employed can a coating of gold of " any thickness be produced on steel, so as to adhere to it at all " firmly."

[Printed, 3*d*.]

A.D. 1860, September 4.—N° 2131.

HUGHES, JOHN, WILLIAMS, WILLIAM, and LEYSHON, GEORGE.—" Improvements in the manufacture of tin and terne " plates, and in apparatus employed therein."

Instead of raising the plates out of the hot metal, as set forth in N° 933 (A.D. 1859) by means of a rack, " the rack is arranged " to remain in the pot, and a second rack or apparatus is used to " raise the several plates out of the pot and out from between the " spaces of the ordinary rack; the form of this second rack " may be varied, but it is preferred that it should consist of two " notched bars at the lower part, with notches corresponding to " the number of spaces between the ordinary rack; these two " *bars are* affixed to or form part of a suitable frame, by which " *they are lowered* into the pot, so that when the plates are intro-

" duced in succession into the pot between the spaces of the " ordinary rack, the lower edges of the plates will also rest near " their ends in the notched bars or second rack, and when the " rack is full of plates, a third notched bar is caused to be folded " across the upper part of the ordinary rack in such manner that " the notches of the upper bar will receive the upper edges of the " plates between the notches, and thus will the plates be supported " about the middle of their length; this rack is then to be raised, " together with the plates, out of the pot, whilst the ordinary " rack remains in the pot. And in order to retain the heat, a " cover is used, which is introduced into or folded over the pot " and the moveable rack when full of plates, and such cover is " raised up with the moveable rack."

[Printed, 10*d*.]

A.D. 1860, September 5.—N° 2144.

BEDSON, GEORGE.—" Improvements in annealing, cleaning, " and galvanizing, or otherwise coating wire and sheets or strips " of metal with metals."

This invention " consists in causing the wire sheet or strip of " metal to pass through a furnace where it becomes heated, from " whence it is conveyed direct to a vessel containing muriatic " acid or other cleansing liquid;" the said wire may then be coated with zinc or other metal by immersion in the bath of molten metal in the usual way, or the wire may be caused to pass onward through the bath, and finally wound on to a suitable reel, the process being continuous.

The Specification describes and the Drawings show apparatus arranged in proper sequence, so as to perform the above-mentioned operations continuously and in their proper order. Several delivery reels are placed side by side; the wires proceed from these through a series of heated tubes (one to each wire) over suitably placed pullies into the acid trough, under a leaden roller therein, and again over suitably placed pullies to the galvanizing trough. In the galvanizing trough there is a bar, under which the wires pass, thus enabling them to descend to the proper depth into the molten metal. From the galvanizing trough the wires proceed over guide rollers to the receiving reels. The speed of revolution of the receiving reels determines the speed of the wires through the processes and apparatus above described.

If the wire is not to be annealed, the degree of heat to which it is exposed before entering the acid bath is much less than when the wire is annealed as well as cleansed.

[Printed, 9*d*.]

A.D. 1860, October 17.—N° 2527.

BUDD, JAMES PALMER.—"Improvements in the manufacture "of terne plates."

"Heretofore, various arrangements of apparatus have been used "for simultaneously raising the several plates in a pot from the "melted metal therein, but when so doing the plates are very "liable to be injured by the grease or oil and scum floating on "the surface of the melted metal; now my improvements con- "sist in skimming or running the oil or grease and scum off the "melted metal into pockets or receivers at the sides of the pots "or vessels used, the upper edges of the pockets or receivers "being at or near the surface of the metals so that when the oil "or grease and scum have been removed from off the metal they "cannot return or flow back over the melted metal. It is pre- "ferred that the oil or grease and scum should be skimmed off "into the pockets or receivers; but they may be allowed to flow "off from the surface of the metal into the pockets or receivers "at the sides of the vessel."

"When the proper quantity of plates is immersed under the "surface of the molten metal in the wash pot," the oil that rises is removed into the pockets by means of a "rabble." All the plates are then "lifted out of the wash pot before a fresh surface "of oxide has had time to form."

"The metal and oil so flushed or removed into the pockets or "receivers can be returned into the pot, as required, by means of "a suitable ladle."

The wash pot and pockets are "formed of one piece of iron "casting;" one pocket is placed in front of the pot, and one behind it.

[Printed, 6*d*.]

A.D. 1860, October 17.—N° 2531.

LEYSHON, DANIEL AUGUSTUS.—This invention "consists of "certain improvements in coating plates, bars, wire, or other "forms or articles of iron, steel, or zinc with lead in place of the

" ordinary tinning or galvanizing. The article to be operated " upon when of iron or steel is first placed (if necessary) in a " bath containing muriatic acid for the purpose of cleansing. It " is then removed to a bath containing sal-ammoniac in solution; " from which it is removed to grids or grates in an oven or stove " for drying; after which it is taken to a bath with a partition " down a portion of its depth. This divided bath contains molten " lead, with a small portion of zinc. The lead on one side of the " partition is covered with sand, and on the other a lump of sal- " ammoniac is allowed to float on the surface of the lead to " attract the dross. Into this last-named division of the bath the " article to be coated is plunged, and passing under the division " is drawn out through the sand.

" In coating zinc articles, the first bath of muriatic acid and " the drying operation would be omitted, the rest of the process " being the same."

The bath of molten lead is first made with pure lead. It is then rendered " capable of depositing a bright and even coating upon " the sheet of iron or steel;" either by throwing into the lead bath a very small proportion of pure zinc, and raising the temperature of the bath, in order to melt the zinc (allowing the said bath to cool before immersing the articles to be coated); or by dipping a rod of pure zinc into the sal-ammoniac solution, and stirring the lead bath therewith, until the requisite amount of zinc is dissolved.

This process is applicable to baths of lead and tin.

[Printed, 4d.]

A.D. 1860, December 5.—N° 2985.

MOREWOOD, EDMUND.—" Improvements in coating metals."

1st. The use of a fence or flooring, placed between the flux and the bottom of the front outside rollers, to prevent the said rollers from being splashed with flux when immersing the metal sheet into the bath of molten metal. The fence has a narrow opening in it for the plates to pass through into the bath.

2nd. The use of brushes or rubbers (either fixed or rotating), preparatory to passing the sheets into the bath. Brushes or rubbers may also be used at the exit side of the bath, to equalize the coating of melted metal. To cause the sheets to travel in

such direction as will enable the brushes or rubbers to act with good effect, roller or bar guides are placed in suitable positions.

3rd. "The arranging of the rollers working in flux, so that the "sheet, plate, or pieces of metal to be coated shall be near the "surface of the flux when such pieces of metal make their exit "from the rollers."

4th. After the removal of the plates from the tinning pot, they are placed in a bath of grease or flux as a receptacle, from which receptacle they are withdrawn one by one, and passed between brushes or rubbers, or between rollers; these rollers may be heated.

5th. "The use of rollers working in flux in combination with "coating rollers working in the melted coating metal;" this arrangement is used at the exit side of the bath.

6th. "The use of fluted, corrugated, or undulated rollers in "the process of coating sheet metal, in order that the sheets or "plates may be thereby impressed or strengthened in the process "of coating." The corrugations give strength to the sheet, so as to enable it to make its way against the brushes or rubbers; the corrugations may either be retained on the sheet, or may be removed by means of plain rollers.

7th. In cleaning sheets of metal by pickling them in a tank of acid, they are kept separate by means of pegs or bars. A lid is used to the said tank to keep in the acid vapour. The acid vapour is conveyed into another chamber by means of a suitably-placed lead pipe.

8th. "The use of hollow rollers to receive and deliver the "sheets as they emerge from the melted metal or flux, so as to "admit of a current of cold water passing through them in order "to prevent the coating metal on the surface of the sheets "clinging to them."

9th. To prevent the coating metal adhering to the surface of the "withdrawing" rollers, they may be covered with tallow, or other fatty matter.

[Printed, 5*d*.]

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ERRATA.

Page 103, line 11, *for* "Etitjean, Tony," *read* "Petitjean, Tony."

„ 133, line 12, *for* "the metal be deposited," *read* "the metal "to be deposited."

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